doi:10.2533/chimia.2011.542 Chimia 65 (2011) 542–572 © Schweizerische Chemische Gesellschaft

Organic Chemistry **OC 1**

Synthesis of tetracycline analogues

Michael Brand, Rainer Riedl*

Zurich University of Applied Sciences, Institute of Chemistry and Biological Chemistry, Campus Reidbach, CH-8820 Wädenswil, Switzerland

Due to an ever increasing resistance to traditional antibiotic compounds, including those used as a last line of defense, such as Vancomycin, there are many efforts to discover new antibiotic substances [1]. An innovative approach to the resistance problem has recently been discovered [2], in which small organic compounds are used as co-treatments with antibiotics in which the bacteria are rendered susceptible to the original antibiotic and thus circumventing the perpetual need for new antibiotic compounds. To this end, we present the preparation of a concise library of small organic compounds by multistep organic syntheses [3] based on an active tetracycline derivative to probe the functionality and backbone requirements of the system.

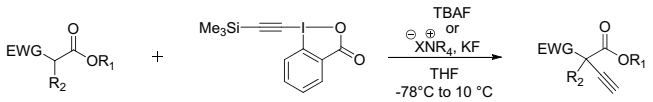
[1] Chrast-Balz, J.; van Huijsdujnen, R. H. *Nucleic Acids Research*, **1996**, *24*, 2900-2904.
[2] Weber, W.; Schoenmakers, R.; Keller, B.; Gitzinger, M.; Grau, T.; Daoud-El Baba, M.; Sander, P.; Fussenegger, M. *PNAS*, **2008**, *105*, 9994-9998.
[3] Kerdesky, F. A.; Ardecky, R. J.; Lakshmikantham, M. V.; Cava, M. P. *J. Am. Chem. Soc*., **1981**, *103*, 1992-1996.

Organic Chemistry **OC 2**

Alkynylation of Soft Nucleophiles using Ethynyl BenziodoXolone (EBX)

Davinia Fernández González and Jérôme Waser*

Laboratory of Catalysis and Organic Synthesis, EPFL, 1015 Lausanne, Switzerland



Acetylenes are versatile intermediates in chemistry, biochemistry and material sciences. Usually, they are synthesized by addition of an acetylide anion to an electrophile. The reverse approach, via an electrophilic acetylene synthon, has been achieved in the case of soft nucleophiles by using alkynyliodonium salts.[1]

We report the first general method for the alkynylation of soft nucleophiles using hypervalent iodine reagent.[2] The developed reaction conditions led to high yields of unprotected acetylenes with cyano, linear keto esters as well as nitro esters. Furthermore, asymmetric induction was observed using cinchona or binaphthyl derived phase-transfer catalysts (60% *ee*).[3] Further optimization of the asymmetric induction is currently ongoing in our group.

Literature:
[1] Ochiai, M.; Ito, T.; Takaoka, Y.; Masaki, Y.; Kunishima, M.; Tani, S.; Nagao, Y. *J. Chem. Soc.-Chem. Commun.* **1990**, 118.
[2] Fernández González, D.; Brand, J. P.; Waser, J., *Chem. Eur. J.* **2010**, *16*, 9457.
[3] Ooi, T.; Kameda, M.; Maruoka, K. *J. Am. Chem. Soc.* **1999**, *121*, 6519.

Organic Chemistry **OC 3**

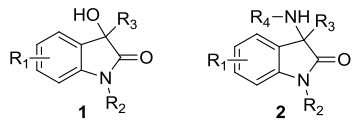
Synthesis of oxindoles by a Friedel-Crafts reaction

Ioulia Gorokhovik, Luc Neuville, Jieping Zhu

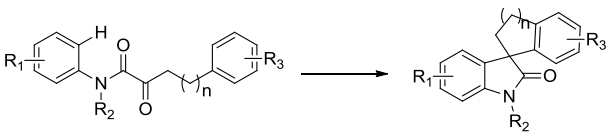
EPFL-SB-ISIC-LSPN, CH-1015 Lausanne, Switzerland
ICSN-CNRS, 1. Av. de la Terrasse, 91190 Gif-sur-Yvette, France

The oxindole motif can be found in many natural products and biologically active molecules. Many different methods to synthesis oxindoles have therefore been developed in the last few years[1]. However, many of these methods lack generality, and give access to oxindoles of limited structural diversity.

We developed a method based on an intramolecular Friedel-Crafts reaction. Starting from α-ketoanilides, 3-hydrox-3'-alkyl(aryl)oxindoles **1** and 3-amino-3'-alkyl(aryl)oxindoles **2** were obtained in good yields[2].



We will also present a domino process leading to spirooxindoles[2].



[1] F. Zhou, Y-L. Liu, J. Zhou, *Adv. Synth. Catal.* **2010**, *352*, 1381.
[2] Results to be published.

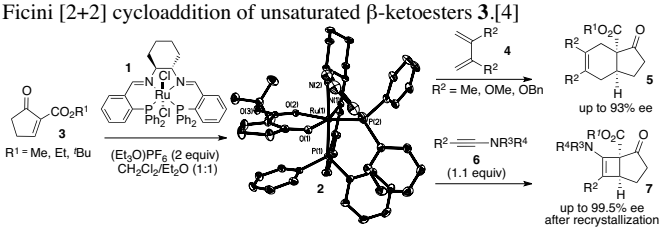
Organic Chemistry **OC 4**

Asymmetric Ruthenium / PNNP-Catalyzed Diels-Alder and Ficini Reactions with Unsaturated β-Ketoesters

Christoph Schotes and Antonio Mezzetti*

Department of Chemistry and Applied Biosciences, ETH Zurich, 8093 Zurich, Switzerland

Unsaturated β-ketoesters have been rarely used in cycloaddition reactions owing to their low reactivity and tendency to polymerization and keto-enol tautomerization [1]. We find now that the dicationic complex [Ru(**3**)(PNNP)]$^{2+}$ (**2**), prepared *in situ* from [RuCl$_2$(PNNP)] (**1**), catalyzes the enantioselective Diels-Alder reaction[2,3] and the first enantioselective Ficini [2+2] cycloaddition of unsaturated β-ketoesters **3**.[4]



In the latter reaction, ynamides **6** react with **3** in the presence of catalyst **2** to give the corresponding cyclobuteneamides **7** with excellent yield and enantioselectivity (13 examples). Both reactions efficiently form all-carbon quaternary stereocenters at the bridgehead position of bicyclic ring systems with high and predictable enantioselectivity.

[1] A. Bernardi, G. Colombo, C. Scolastico, *Tett. Lett.* **1996**, 37, 8921.
[2] C. Schotes, A. Mezzetti, *J. Am. Chem. Soc.* **2010**, *132*, 3652.
[3] C. Schotes, A. Mezzetti, *CHIMIA Laureate Ed.* **2011**, *65* (4), 231.
[4] C. Schotes, A. Mezzetti, *Angew. Chem. Int. Ed.* **2011**, *50*, 3072.

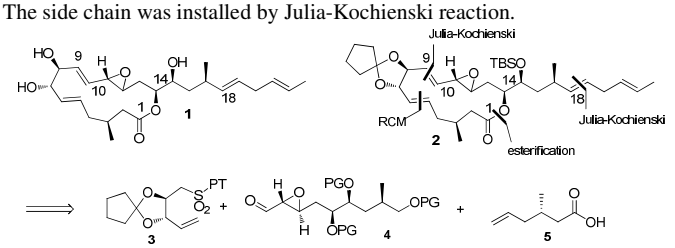
Organic Chemistry **OC 5**

Studies Towards the Total Synthesis of Iriomoteolide 3a

Evgeny V. Prusov, Carolin Schwehm, Karl-Heinz Altmann

Institute of Pharmaceutical Sciences/ETH Zürich, Wolfgang-Pauli-Str.10, CH-8093 Zürich, Switzerland

Iriomoteolide 3a (**1**) is a marine macrolide isolated in 2007 by Tsuda *et al.,* which shows potent cytotoxicity against lymphoma cell lines in the low nM range.[1] The molecular target(s) of **1** are unknown and only one total synthesis is described in the literature.[2] Our laboratory is pursuing the synthesis of **1**, in order to provide material for more extensive biological investigations and as a basis for the synthesis of analogs for SAR studies. These efforts so far have resulted in the synthesis of cyclopentylidene acetal **2**. Key steps in the synthesis of the macrocyclic core of **2** were the Julia-Kochienski olefination of sulfone **3** and aldehyde **4**, Steglich-Keck esterification of C14-OH with acid **5** and ring-closure through ring-closing metathesis (RCM). The side chain was installed by Julia-Kochienski reaction.



Unfortunately, all attempts to cleave the cyclopentylidene acetal in **2** only resulted in decomposition. This contribution will report on the details of the synthesis of **2** and it will discuss a modified strategy that is designed to overcome the protecting group problems associated with **2**.

[1] M. Tsuda *et al., J. Org. Chem.* **2008**, *73*, 1567-1570.
[2] C. Nevado *et al., Angew. Chem. Int. Ed.* **2009**, *48*, 8780-8783.

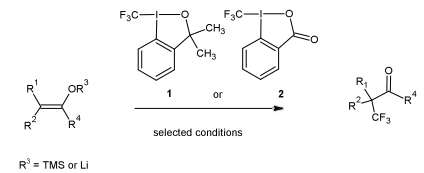
Organic Chemistry **OC 6**

Synthesis of α-CF_3-substituted carbonyl compounds using electrophilic CF_3-transfer reagents

Václav Matoušek[1], Vincent Bizet[2], Dominique Cahard[2] and Antonio Togni[1]

[1] Department of Chemistry and Applied Biosciences, Swiss Federal Institute of Technology, ETH Zurich, CH-8093 Zürich, Switzerland

[2] Institut de Recherche en Chimie Organique Fine, Université de Rouen, Rue Tesnière, F-76821 Mont Saint Aignan Cedex, France



Trimethylsilyl ketene acetals derived from 5- and 6-membered lactones underwent efficient trimethylsilyl bis-(trifluoromethanesulfonyl)imide-catalysed trifluoromethylation with **1** and catalyst loadings as low as 1 mol%, thus opening a straightforward access to products with quaternary carbon centres which are otherwise difficult to prepare. Based on our experimental observations, we have good reason to believe that trifluoromethylation of trimethylsilyl ketene acetals proceeds via O-silylated form of **1** with more pronounced iodonium character as an intermediate.
Evans-type acyloxazolidinones were trifluoromethylated with **2** via their corresponding lithium enolates in good to excellent isolated yields and diastereomeric ratios up to 97:3.
The scope of these transformations, a plausible reaction mechanism and intrinsic reactivity patterns of both reagents towards enolisable carbonyl compounds will be compared and discussed.

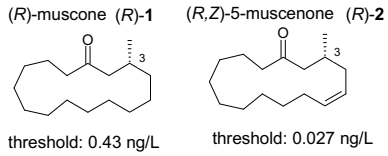
Organic Chemistry **OC 7**

New Approaches to the Synthesis of the Musk Odorants (*R*)-Muscone and (*R,Z*)-5-Muscenone

Jerome Kuhne, Oliver Knopff

Firmenich SA, Corporate R&D Division, Route des Jeunes 1, B.P. 239, 1211, Genève 8 (Switzerland)

The two powerful musk odorants (R)-Muscone **1** and (*R,Z*)-5-muscenone **2** have not been used in commercial fragrances, which indicates that the published syntheses do not completely fulfill the requirements for a large-scale preparation. In view of the growing interest from the fragrance industry[1] and academia[2] in (*R*)-**1**, and the exceptional olfactory characteristics of (*R*)-**2**, practical syntheses of both of these compounds are highly desirable.
Herein we describe short and efficient approaches to (R)-**1** and (*R,Z*)-5-muscenone **2** (up to 90% *ee*) by using unprecedented key steps.[3]



[1] a) D. Masaharu WO2010109650, 2010, *Chem. Abstr.* **2010**, *153*, 480769.
[2] a) X. Sun, F. Yu, T. Ye, X. Liang, J. Ye *Chem. Eur. J.* **2011**, *17*, 411 b) B. Bulic, U. Lücking, A. Pfaltz, *Synlett* **2006**, 1031; c) M. Ito, S. Kitahara, T. Ikariya, *J. Am. Chem. Soc.* **2005**, *127*, 6172; d) C. Fehr, J. Galindo, O. Etter, *Eur. J. Org. Chem.* **2004**, 1953; e) C. Fehr, J. Galindo, I. Farris, A. Cuenca, *Helv. Chim. Acta* **2004**, *87*, 1737 and references cited therein.
[3] O. Knopff, J. Kuhne, C. Fehr; *Angew. Chem. Int. Ed.* **2007**, *46*, 1307.

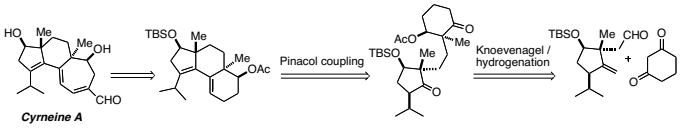
Organic Chemistry **OC 8**

Towards the Total Synthesis of Cyrneine A, a Cyathane Diterpene Promoting Neurite Outgrowth

Elangovan Elamparuthi[1], Cindy Fellay[2], Markus Neuburger[1], Karl Gademann[1,*]

[1] University of Basel, Department of Chemistry, St. Johanns-Ring 19, CH-4056 Basel, Switzerland
[2] EPFL, ISIC, 1015 Lausanne, Switzerland

Cyathane diterpenes possess an unusual angularly fused 5-6-7 tricyclic framework with 1,4-*anti* methyl groups at the angular quaternary centers. Ayer and coworkers isolated the first natural product of this class in 1971.[1] In 2006, the two cyathane diterpenes cyrneines A and B were isolated from the mushroom *Sarcodon cyrneus*.[2] In this isolation report, this class of natural products was reported to mimic or to induce the activity of neurotrophins.[2] In later studies, cyrneine was postulated to act *via* a Rac1-dependant mechanism.[3] We will report on our synthetic studies towards these targets. Knoevenagel/hydrogenation and pinacol coupling were employed as the key steps for the synthesis of advanced intermediates leading to the total synthesis of cyrneine A.



[1] A. D. Allbutt, W. A. Ayer, H. J. Brodie, B. N. Johri, H. Taube, *Can. J. Microbiol*. **1971**, 1401 – 1407.
[2] M. C. Marcotullio, R. Pagiott, F. Maltese, Y. Obara, T. Hoshino, N. Nakahata, M. Curini, *Planta Med*. **2006**, *72*, 819-823.
[3] Y. Obara, T. Hoshino, M. C. Marcotullio, R. Pagiotti, N. Nakahata, *Life Sciences* **2007**, *80*, 1669.

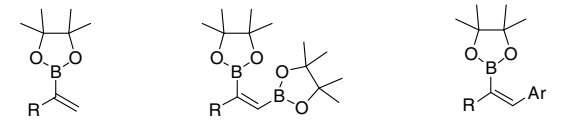
Organic Chemistry **OC 9**

Iridium Catalyzed Hydrogenation of Alkyl Boronic Esters

Adnan Ganić, Andreas Pfaltz*

Department of Chemistry, University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

Iridium catalyzed hydrogenation combines all of the requirements for modern asymmetric synthesis, such as, perfect atom economy, low catalyst loading, high conversion and ideally, high enantiomeric induction. Therefore asymmetric reduction of weakly coordinating substrate like enol esters and ethers represents a growing area with a huge potential.[1] In our research group we recently began to study the hydrogenation of alkyl boronic esters leading to chiral boronic compounds, which can be easily transformed to various functional groups. While rhodium catalyzed hydrogenation with chiral P,P ligands suffers from higher catalyst loading (2–5 mol-%) for those substrates,[2] iridium based systems were reported to be more active (0.5 mol-% catalyst loading), but only highly enantioselective for aryl boronic esters.[3] Herein we report iridium catalyzed asymmetric hydrogenation of alkyl based boronic esters using P,N ligands developed in our group.



[1] S. J. Roseblade, A. Pfaltz, *Acc. Chem. Res.* **2007**, *40*, 1402–1411.
[2] a) J. Morgan, J. Morken, *J. Am. Chem Soc.* **2004**, *126*, 15338−15339, b) W. Moran, J. Morken, *Org. Lett.* **2006**, *126*, 2413−2415.
[3] A. Paptchikhine, P. Cheruku, M. Engman, P. Andersson, *Chem. Commun.* **2009**, 5996–5998.

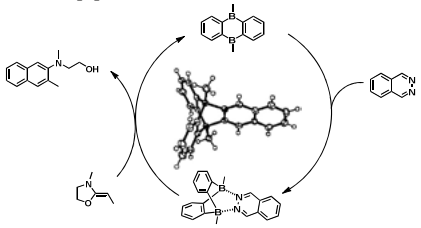
Organic Chemistry **OC 10**

Bidentate Lewis Acids as Efficient Catalysts for the Inverse Electron Demanding Diels-Alder Reaction

Simon N. Kessler, Hermann A. Wegner

Department of Chemistry, University of Basel, St. Johanns-Ring 19, Basel

Lewis acid catalysis is one of the major modes of activation in Organic Synthesis.[1] The chemistry of bidentate Lewis acid catalysts belongs to an unexplored field of science and has been only poorly studied so far.[2] Additionally, in the majority of these cases the bidentate Lewis acid only binds to one donor atom. In this presentation we describe for the first time the activation of 1,2-diazene by a bidentate Lewis acid for an inverse electron demanding Diels Alder (IEDDA) reaction.[3] This conceptional new mode of catalysis enables the IEDDA reaction of unactivated diazines with a wide range of dienophiles and offers a new entry to 1,2-substituted aromatics. The substrate scope, mechanistic investigations as well as further applications will be discussed.[4]



[1] Yamamoto, H., Ed. *Lewis Acids in Organic Synthesis*; Wiley-VCH, Weinheim, 2000.
[2] Maruoka, K. *Catalysis Today* **2001**, *66*, 33–45.
[3] Kessler, S. N., Wegner, H. A. *Org. Lett.* **2010**, *12*, 4062–4065.
[4] Kessler, S. N.; Neuburger, M.; Wegner, H. A. *Eur. J. Org. Chem.* **2011**, accepted.

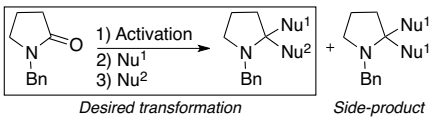
Organic Chemistry **OC 11**

Addition of Mono-organocopper Reagents to Thioiminium Ions

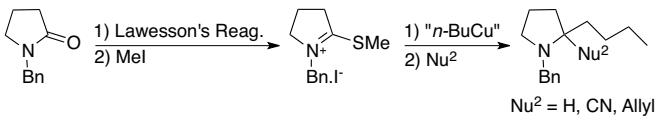
Pierre Mateo, Philippe Renaud*

Universität Bern, *Departement für Chemie und Biochemie*, Freiestrasse 3, CH-3012 Bern, Switzerland

Non-symmetrical *gem*-dialkylation of lactams is an attractive method for alkaloid synthesis. The methods developed to achieve this transformation require a prior activation, such as formation alkoxy-iminium ion, followed by successive addition of two nucleophiles.[1] However, formation of the symmetrical *gem*-dialkylation side-product cannot be avoided.[2]



We report here that the use of mono-organocopper reagents as first nucleophile with thioiminum ions allows the clean formation of non-symmetrical products. An intriguing mechanism operates and our studies towards its elucidation will be disclosed.



[1] K.-J. Xiao, J.-M. Luo, K.-Y. Ye, Y. Wang, P.-Q. Huang *Angew. Chem. Int. Ed.* **2010**, *49*, 3037.
[2] A. Agosti, S. Britto, P. Renaud *Org. Lett.* **2008**, *10*, 1417.

Organic Chemistry **OC 12**

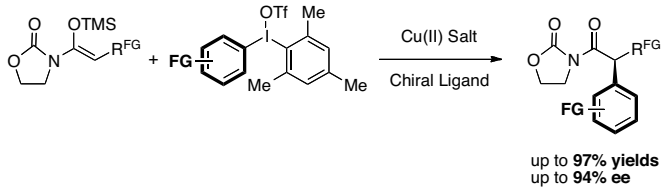
Copper Catalysed Enantioselective α-Arylation of Silyl Ketenimides

Aurelien Bigot, Alice E. Williamson, Matthew J. Gaunt*

Department of Chemistry, University of Cambridge, Lensfield Road, Cambridge, CB2 1EW, United Kingdom

The catalytic enantioselective coupling of transient enolates with aryl electrophiles to access tertiary benzylic centres is an unsolved challenge for organic synthesis. [1] The ubiquitous nature of α-aryl carboxylic acids in both therapeutics and as useful organic intermediates exemplifies the importance of addressing this problem. [2]

We present herein the first enantioselective α-arylation of silyl ketenimides using diaryliodonium salts in the presence of a chiral copper catalyst. The mild conditions developed allow an efficient and highly stereoselective access to enolisable α-carbonyl benzylic centres bearing a variety of functional groups.



[1] (a) For a recent review of metal-catalyzed α-arylations of carbonyl compounds, see: C. C. C. Johansson, T. J. Colacot, *Angew. Chem. Int. Ed.* **2010**, *49*, 676–707. (b) For an "umpolung" approach, see: P. M. Lundin, G. C. Fu, *J. Am. Chem. Soc.* **2010**, *132*, 11027-11029 and references herein. (c) An organocatalytic solution to this problem has been recently disclosed: A. E. Allen, D. W. C. MacMillan, *J. Am. Chem. Soc.* **2011**, *ASAP*.
[2] M. F. Landoni, A. Soraci, *Curr. Drug Metab.* **2001**, *2*, 37–51.

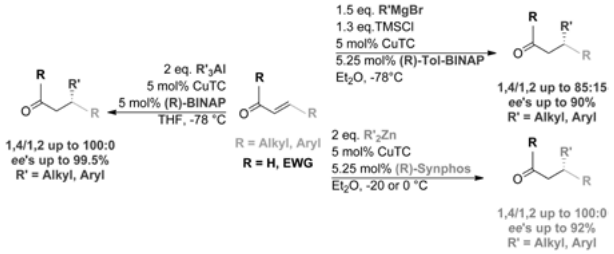
Organic Chemistry **OC 13**

Enantioselective Copper Catalyzed 1,4 addition to challenging Michael acceptors and synthesis of relevant target molecules

Ludovic Gremaud, Alexandre Alexakis*

University of Geneva, Faculty of Sciences, Quai Ernest-Ansermet 30, Department of organic chemistry, CH-1211 Geneva 4, Switzerland
Email: alexandre.alexakis@unige.ch

The copper-catalyzed asymmetric conjugate addition (A.C.A) of organometallic reagents to Michael acceptors is among the most important methodologies to form a C-C bond in enantioselective manner. In this field, a variety of α,β-unsaturated compounds have been successfully used.[1] On the other hand, functionalized α,β-unsaturated Michael acceptors are more challenging substrates because of their high reactivity toward the undesired 1,2 addition.[2] Scope, limitations and potential synthetic applications will be presented for relevant target molecules.



[1] (a) Alexakis, A.; Benhaim, C. *Eur. J. Org. Chem.* **2002**, 3221; (b) Alexakis, A.; Backväll, J. E.; Krause, N.; Pamies, O.; Dieguez, M. *Chem. Rev.* **2008**, *108*, 2796; (c) Harutyunyan, S. R.; den Hartog, T.; Geurts, K.; Minnaard, A. J.; Feringa, B. L. *Chem. Rev.* **2008**, *108*, 2824-2852.
[2] Palais, L.; Babel, L.; Quintard, A.; Belot, S.; Alexakis, A. *Org. Lett.* **2010**, *12*, 1988.

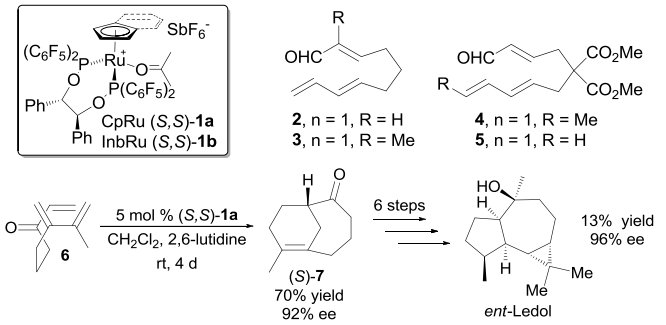
Organic Chemistry **OC 14**

Synthesis of *ent*-Ledol by Application of Chiral Ru Lewis acid Catalyzed Asymmetric Intramolecular Diels-Alder Reactions

Sirinporn Thamapipol and E. Peter Kündig

Department of Organic Chemistry, University of Geneva, 30 quai Ernest Ansermet, CH-1211 Geneva 4, Switzerland.
Email:peter.kundig@unige.ch

Chiral one-point binding Ru Lewis acids **1** incorporating a C_2-symmetric phosphinite ligand can efficiently activate enals and enones and catalyze inter- and intramolecular Diels-Alder reactions stereoselectively.[1] This protocol is applied as a key step for the preparation of highly enantioenriched adduct **7**, which is the crucial intermediate in the total synthesis of *ent*-ledol. The overall yield of *ent*-ledol is 13% in 6 steps with 96% ee.



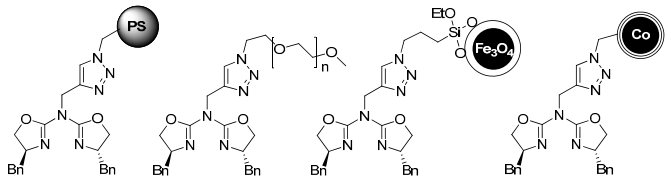
[1] a) Rickerby, J.; Vallet, M.; Bernardinelli, G.; Viton, F.; Kündig, E. P. *Chem. Eur. J.* **2007**, *13*, 3354 and ref. cit.; b) Thamapipol, S.; Bernardinelli, G.; Besnard, C.; Kündig, E. P. *Org. Lett.* **2010**, *12*, 5604; c) Thamapipol, S.; Kündig, E. P. *Chimia*, **2011**, *65*(4).

Organic Chemistry **OC 15**

A Comparative Study of Polymer and Nanoparticle Supports for Asymmetric Catalysts

Alexander Schätz, Martin Zeltner, and Wendelin J. Stark*

* Department of Chemistry and Applied Biosciences, Institute for Chemical and Bioengineering, ETH Zurich, CH-8093 Zurich, Switzerland



Separation and recycling of homogeneous catalysts is a main objective in green chemistry. One approach to environmentally benign processes is based on the development of solid-supported catalysts. On the one hand, heterogeneous supports (e.g. polystyrene) allow efficient recycling via filtration, but a substantial decrease in activity is frequently observed. On the other hand, soluble scaffolds usually require a second solvent for the selective precipitation of matrices out of the reaction mixture (e.g. MeOPEG). Nanoparticles (NPs) are considered a semi-heterogeneous support since they feature almost homogeneous-like accessibility of the surface-bound catalytic sites. Therefore, NPs might have benefits over conventional supports. This hypothesis was put to test. A chiral organometallic compound (an azabis(oxazoline)-copper complex[1]) was immobilized on polystyrene, MeOPEG, superparamagnetic magnetite and ferromagnetic cobalt NPs. Activity, selectivity and recyclability of the supported catalysts were tested in the kinetic resolution of racemic 1,2-diols. Indeed, the nanoparticle grafted catalysts outperformed the polymer based analogs. This proved the initial hypothesis: catalytic sites grafted on globular nanosupports might be more active than their polymeric counterparts under certain conditions.

[1] A. Schätz, M. Hager, O. Reiser, *Adv. Funct. Mater.* **2009**, *19*, 2109.

Organic Chemistry **OC 16**

Intramolecular H-Shift Reactions in Cysteinyl Radicals:

T. Nauser,[a] C. Schöneich,[b] W. H. Koppenol[a]

[a] Departement für Chemie und Angewandte Biowissenschaften, Wolfgang-Pauli-Str. 10, ETH Zürich (CH); [b] Department of Pharmaceutical Chemistry, The University of Kansas, Lawrence (USA)

Intramolecular H-abstraction from $^{\alpha}$C-H in peptides by thiyl radicals leads to formation of $^{\alpha}C^{\bullet}$ amino acid radicals which are stabilized [1]. Calculations predict that the bond dissociation energy (BDE) of a $^{\alpha}$C-H is approximately 350 kJ/mol [2] instead of a normal BDE(C-H) of approximately 385 kJ/mol [3]; in comparison, the BDE of thiols is 365 kJ/mol [2]. Therefore, in an intramolecular equilibrium, substantial amounts of $^{\alpha}C^{\bullet}$ and thiyl, but no $^{\beta}C^{\bullet}$ amino acid radicals are expected.
In NMR investigations of products of glutathione radical reactions we found however, that also non-$^{\alpha}C^{\bullet}$ carbon centered radicals are in equilibrium with the thiyl radical, in agreement with UV investigations [4].
As this result is in contrast to expectation, we decided to look if such intramolecular hydrogen transfer reactions can be found in cysteine at acidic and basic pH. With the use of several reference compounds we are able to distinguish between 1,2 and 1,3 H-shift reactions in time resolved UV-spectroscopy. Surprisingly, the $^{\beta}C^{\bullet}$ radical formed by 1,2 H-shift from the thiyl radical seems to be more abundant than the $^{\alpha}C^{\bullet}$ radical: Cys-$^{\beta}C^{\bullet}$ radicals must therefore be stabilized by some yet unknown process. The equilibration process of 1,2 and 1,3 H-shifts is fast, in the microsecond timescale. Therefore "thiyl radical" recombination does not lead to disulfides only [5,6], as is commnly assumed in the literature.

[1] T. Nauser et al., *J.Phys.Chem.B,* **2008,** 112, 15034
[2] A. Rauk et al., *Biochemistry*, **1999**, 38, 9089
[3] B. Ervens et al, *Phys. Chem. Chem. Phys.*, **2003**, 5, 1811
[4] D. Hofstetter et al, *Chem. Res. Toxicol.*, **2010**, 23, 1596
[5] L. B. Barron et al., *J.Phys.Chem.A*, **2004**, 108, 2247
[6] O. Mozziconacci et al., *J.Phys.Chem.B*, **2010**, 114, 3668

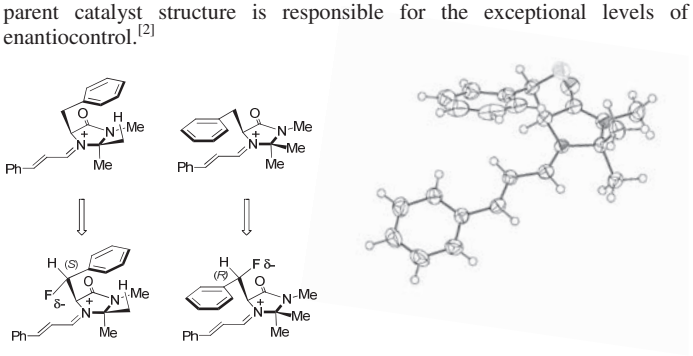
Organic Chemistry **OC 17**

Fluoro-Organocatalysts: Conformer Equivalents as a Tool for Mechanistic Studies

Christof Sparr and Ryan Gilmour

ETH Zürich, Wolfgang-Pauli-Strasse 10, 8093 Zürich, Switzerland

Herein we disclose the concept of "conformer equivalents" as a tool to investigate non-covalent interactions in organocatalysis. The strategic introduction of a fluorine atom into the catalyst structure results in stabilising hyperconjugative [$\sigma_{C\text{-}H} \rightarrow \sigma^*_{C\text{-}F}$] and/or electrostatic [$N^{+\cdots}F^{\delta-}$] interactions in the central iminium ion intermediate that consequently influences conformation.[1] This renders the C-F bond an excellent steering group for controlling molecular topology without introducing additional steric constraints. From this study it may be deduced that a symbiotic interplay of conformers in the parent catalyst structure is responsible for the exceptional levels of enantiocontrol.[2]



[1] C. Sparr, W. B. Schweizer, H. M. Senn and R. Gilmour, *Angew. Chem.* **2009**, *121*, 3111-3114; *Angew. Chem. Int. Ed.* **2009**, *48*, 3065-3068.
[2] C. Sparr and R. Gilmour, *Angew. Chem.* **2010**, *122*, 6670-6673; *Angew. Chem. Int. Ed.* **2010**, *49*, 6520-6523.

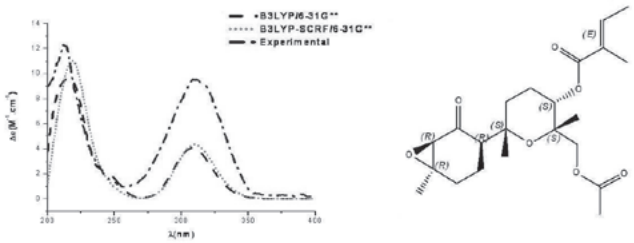
Organic Chemistry **OC 18**

Antiplasmodial Bisabolene Oxide Derivatives from *Artemisia persica* – Absolute Configuration by Density Functional Theory Calculation of ECD Spectra

Fahimeh Moradi-Afrapoli[1], Samad Nejad Ebrahimi[2], Stefanie Zimmermann[2], Melanie Quitschau[2], Martin Smiesko[3], Matthias Hamburger[2]

[1]Department of Pharmacognosy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran
[2] Pharmaceutical Biology and [3] Molecular Modelling, Department of Pharmaceutical Sciences, University of Basel, Basel, Switzerland

In a screening for bioactive compounds from Iranian medicinal plants, an EtOAc extract of *Artemisia persica* Boiss. (Asteraceae) showed notable antiplasmodial activity against *P. falciparum* K1 strain (78.6 % inhibition at 0.85 µg/ml). Active compounds in the extract were tracked by HPLC-based profiling. Subsequent preparative isolation of the peaks in the bioactive time windows resulted in five new bisabolene sesquiterpene diesters. Relative stereochemistry was established by NOESY and NOE difference measurement, and absolute configuration of the constituents was assigned by comparison of experimental CD spectra with simulated ECD spectra using density function theory (DFT) in gas phase (B3LYP/6-31G**) and methanol (B3LYP-SCRF /6-31G**).



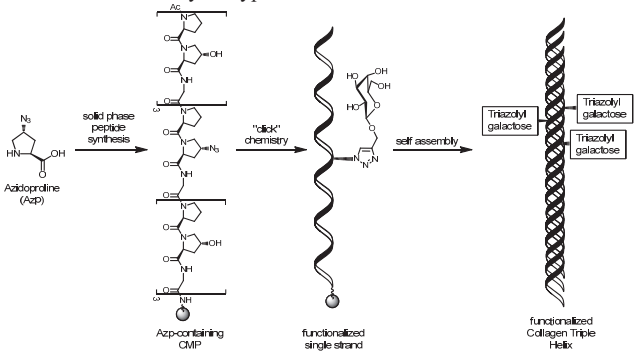
Organic Chemistry **OC 19**

Functionalized Collagen Model Peptides

Roman S. Erdmann, Helma Wennemers

University of Basel, Department of Chemistry, St. Johanns-Ring 19, 4056 Basel

The stability and many functions of collagen, which is the most abundant protein in mammals, depend to a large extent on functional groups attached to its backbone.[1] Aside from hydroxylations other modifications such as for example galactosylations are known to influence the stability of the collagen triple helix.[2] Derivatized collagens are also becoming increasingly attractive for the development of synthetic functional materials. Herein we introduce azidoproline (Azp)-containing collagen model peptides that can easily be functionalized with various groups using "click" chemistry. In addition, we demonstrate that Azp residues have effects on the stability of collagen that are similar to those of hydroxyproline.[3,4]



[1] Shoulders, M. D.; Raines, R. T. *Annu Rev Biochem* **2009**, *78*, 929.
[2] Bann, J. G.; Peyton, D. H.; Bachinger, H. P. *Febs Lett* **2000**, *473*, 23.
[3] Erdmann, R. S.; Wennemers, H. *J. Am. Chem. Soc.* **2010**, *132*, 13957.
[4] Erdmann, R. S.; Wennemers, H, *Angew. Chem., Int Edit.*, under revision.

Organic Chemistry **OC 20**

Formation, functionalization and assembly of dendrimer stabilized gold nanoparticles

Jens P. Hermes, Fabian Sander, Marcel Mayor*

University of Basel, St. Johanns-Ring 19, 4056 Basel, Switzerland

Gold nanoparticles (Au NPs) are promising materials for nanotechnology, with applications in electronics, catalysis and sensing. These applications depend on the ability to synthesise stable and monodisperse NPs.
We present the design and synthesis of dendritic thioether ligands and their ability to stabilize Au NPs with a diameter of 1.1 nm (Figure 1). The NPs show excellent long-term stability due to a bulky ligand shell that is formed by *t*-butyl phenyl moieties. A similar series of dendrimers shows that the replacement of *t*-butyl phenyl groups by ethylene units leads to agglomeration of NPs.
We recently showed that Au NPs stabilized by linear thioether ligands can be covalently coupled to organic-inorganic hybrid oligomers [1,2]. A functionalization of dendritic ligands with a central acetylene (R in Figure 1) enables this coupling for dendrimer stabilized NPs. As the second generation dendrimer results in a complete NP coverage by just one ligand we obtain monofunctionalized NPs and thus dumbbell-structures upon coupling.

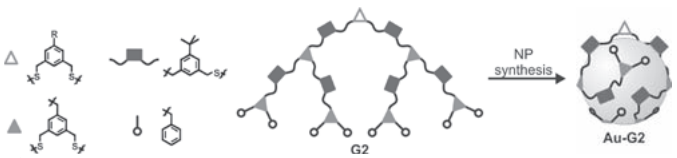


Figure 1. Second generation dendrimer (**G2**) and **G2**-stabilized Au NP; R = *t*-butyl or acetylene-TIPS.

[1] J. P. Hermes, F. Sander, T. Peterle, M. Mayor, *CHIMIA* **2011**, 65, 219.
[2] J. P. Hermes, F. Sander, T. Peterle, C. Cioffi, P. Ringler, T. Pfohl, M. Mayor, *Small* **2011**, 7, 920.

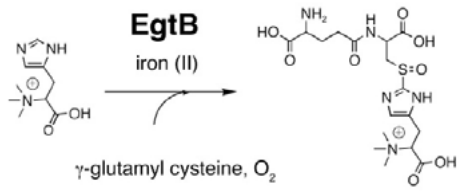
Organic Chemistry **OC 21**

Oxidative sulfur transfers

F. P. Seebeck

Department of Chemistry, University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland
Email: florian.seebeck@unibas.ch

Ergothioneine is a histidine-derived thiol of bacterial and fungal origin but has been isolated also from animal and human tissue. Recent findings point to critical functions of ergothioneine in human physiology but its role in microbial life is poorly understood. We have identified a five gene cluster from mycobacteria which is responsible for ergothioneine biosynthesis. The key reaction is catalyzed by an unusual non-heme iron enzyme which affords oxidative insertion of a sulfur atom into the imidazole C_2-H bond of histidine. Our recent efforts in exploring this novel class of enzymes will be discussed.



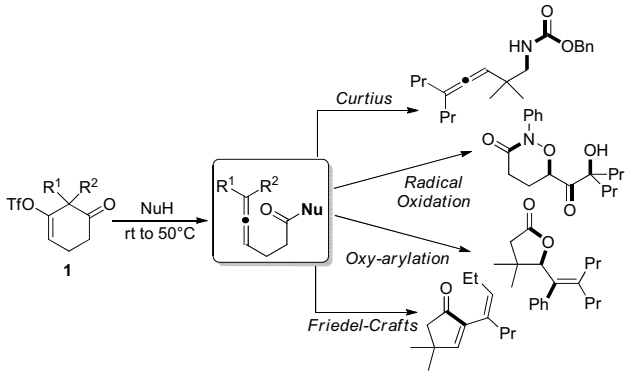
Organic Chemistry **OC 22**

Accessing Funtionalized Allene Intermediates By C–C Fragmentation

Tanguy Saget, Nicolai Cramer*

Laboratory of Asymmetric Catalysis and Synthesis, EPF Lausanne
EPFL SB ISIC LCSA, CH-1015 Lausanne, Switzerland

The rich structural and reactivity profile of allenes render them uniquely versatile synthetic intermediates. Williams and co-workers showed that functionalized allenes can be accessed from vinyl triflate with certains lithium and Grignard reagents *via* Grob-type fragmentation [1]. We report mild conditions that largely broaden the scope of the fragmentation for substrates such as **1** [2]. For example, simple alcohols and amines are now competent nucleophiles and the reaction is well disposed to initiate domino processes providing a range of synthetically useful compounds in a single step from simple precursors.



[1] R. V. Kolakowski, M. Manpadi, Y. Zhang, T. J. Emge, L. J. Williams, *J. Am. Chem. Soc.* **2009**, *131*, 12910.
[2] T.Saget, N. Cramer, *Angew. Chem. Int. Ed.* **2010**, *49*, 8962.

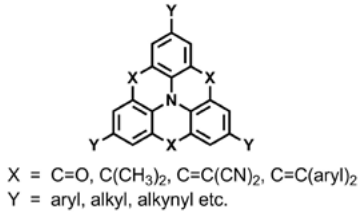
Organic Chemistry **OC 23**

Functional π-Conjugated Materials Based on Bridged Triphenylamines

Martin Pröller, Milan Kivala*

Lehrstuhl für Organische Chemie I, University of Erlangen-Nürnberg, Henkestraße 42, D-91054 Erlangen, Germany

The nanostructures obtained upon π-π interactions between extended aromatic systems can provide charge-transporting pathways and thus have been intensely studied as active materials in organic electronic and opto-electronic devices [1]. Tunig the electronic and opto-electronic properties (*i.e.* HOMO/LUMO gap) and supramolecular behavior of such π systems can be achieved upon (i) increase in size, (ii) peripheral decoration with electron donor and/or electron acceptor moieties, and (iii) introduction of heteroatoms directly into the aromatic skeleton.



The potential of bridged triphenylamine scaffolds for the construction of interesting π-conjugated systems with unusual properties has by far not been exhausted to date [2]. Here, we present advances in the chemistry of such systems featuring inter- and/or intramolecular charge-transfer interactions and a pronounced propensity for self-assembly to form nanostructures of different morphologies.

[1] W. Pisula, X. Feng, K. Müllen, *Chem. Mater.* **2011**, *23*, 554.
[2] D. Hellwinkel, M. Melan, *Chem. Ber.* **1971**, *104*, 1001.

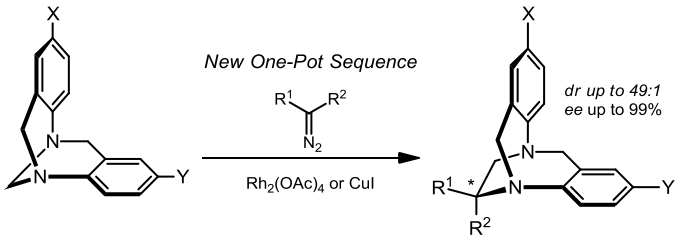
Organic Chemistry **OC 24**

One-step Catalytic Asymmetric Synthesis of Configurationally Stable Tröger bases

Ankit Sharma, Laure Guénée, Jean-Valère Naubron, Jerome Lacour*

Department of Organic Chemistry, University of Geneva
Quai Ernest Ansermet 30, 1211 Geneva 4, Switzerland.

Tröger bases have been extensively studied for their interesting properties, reactivity and a host of applications.[1] In stereochemistry, Tröger bases are unique being the first chiral compounds with stereogenic nitrogen atoms to be resolved.[2] However, *methano*-bridged Tröger bases undergo facile racemisation under acidic conditions. One way to overcome this drawback is by synthesizing *ethano*-bridged derivatives.[3] Herein, we report the one-step metal-catalyzed reaction of *methano*-Tröger bases and diazo esters yielding highly enantioenriched configurationally-stable *ethano*-Tröger derivatives.[4] The process is general, enantiospecific (*ee* up to 99%, retention of configuration), diastereoselective (quaternary carbon center introduction, *dr* up to 49:1) and allows to draw important mechanistic conclusions.



[1] Recent Review: Sergeyev, S. A. *Helv. Chim. Acta* **2009**, *92*, 415.
[2] Prelog, V.; Wieland, P. *Helv. Chim. Acta* **1944**, *27*, 1127-1134.
[3] Hamada, Y.; Mukai S. *Tetrahedron: Asymmetry* **1996**, *7*, 2671.
[4] Sharma, A.; Guénée, L. ; Naubron, J.-V. ; Lacour J. *Angew. Chem. Int. Ed.* **2011**, *50*, 3677.

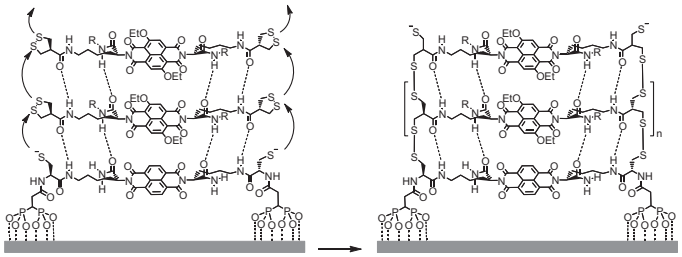
Organic Chemistry **OC 25**

Self-Organizing Surface-Initiated Polymerization (SOSIP) : A New Approach to Organic Solar Cells

Jetsuda Areephong, Marco Lista, Naomi Sakai and Stefan Matile*

Department of Organic Chemistry, University of Geneva, Switzerland

In organic optoelectronics, it is a key challenge to design supramolecular n/p-heterojunctions (SHJs) that transport hole and electron efficiently [1]. Herein, we report self-organizing surface-initiated polymerization (SOSIP) as user-friendly method to create ordered as well as oriented functional systems on transparent oxide surfaces. An initiator functionalized with phosphonate and thiol groups is adsorbed on an ITO substrate. Then the polymerization of monomers, equipped with disulfide units, occurs in a vertical manner to assure the controlled growth of the polymer from the surface [2]. Combined with self-sorting during co-SOSIP, Our results provide general multichannel architectures with oriented multicomponent gradients, including organic solar cells, photodiode switches and so on.



[1] Bhosale, R.; Míšek, J.; Sakai, N.; Matile, S. *Chem. Soc. Rev.* **2010**, *39*,138-149.
[2] Lista, M.; Sakai, N.; Areephong, J.; Kel, O.; Emery, D.; Mareda, J.; Vauthey, E.; Matile, S. *submitted.*

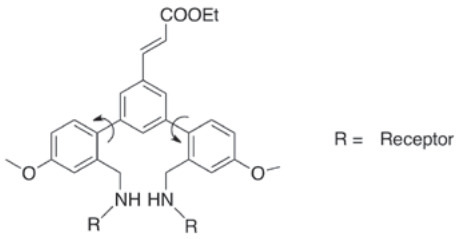
Organic Chemistry **OC 26**

Fluorescence based Metal ion detection : Binding induced conformational restriction mechanism

Rahul S. Kathayat, Nathaniel S. Finney*

University of Zürich, Winterthurerstr. 190, CH-8057 Zürich, Switzerland

Metal ions play an important role in our life but, excess and deficiency of these bring us problems as well. Heavy metal ions e.g. Hg(II), Cd(II) are well known for their devastating effects. This motivates us to come up with tools for their detection. Fluorescence being highly sensitive, non-invasive stands well as a powerful tool. But, most metallic analytes are non-fluorescent in nature. That's where there is role of fluorescent chemosensors – molecules which on binding to non-fluorescent analytes provide fluorescence response. Signalling mehcanisms on which most of the fluorescent chemosensors based are PET, FRET etc. But, these mechanisms suffer structural limitations e.g. essence of Benzylic or Anilinc nitrogen for PET. We would like to exploit conformational restriction as a signaling mechanism, which we expect will minimize structural restriction of the binding domains. [1,2]



[1] Sherri A. McFarland, Nathaniel S. Finney, *J. Am. Chem. Soc.* **2001**, *123*, 1260.
[2] Sergey A. Malashikhin, Kim K. Baldridge, Nathaniel S. Finney, *Org. Lett.* **2010**, *12*, 940.

Organic Chemistry **OC 27**

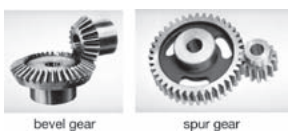
Molecular Spur Gears

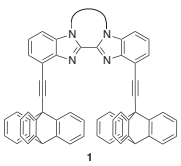
Derik K. Frantz, Kim K. Baldridge*, Jay S. Siegel*

Organic Chemistry Institute, University of Zurich, Winterthurerstrasse 190, 8057 Zurich, Switzerland

Triptycene (Tp) rotators, incorporated into bevel gear constructs, have shown geared (correlated) rotation.[1] Related spur gear constructs, where Tp groups that intermesh with parallel axes of rotation, have not been studied. Analysis of the structure of Tp reveals that an axle–axle distance of approximately 8 Å accommodates a Tp-based spur gear construct.[2] Derivatives at the 4- and 4'-positions of 2,2'-bibenzimidazole project substituents in parallel at this distance.[3]

Computational data of derivatives of **1** using the B97-D/DZV(2d,p) method indicate that geared rotation of the Tp groups requires less energy than gear slippage, implying that desymmetrized derivatives of **1** should exhibit residual diastereoisomerism when the rate of gear slippage is slow.[1] A combination of theory, synthesis, NMR spectroscopy and stereochemical analysis form the basis for testing this spur gear assembly.





[1] Iwamura, H.; Mislow, K. *Acc. Chem. Res.* **1988**, *21*, 175.
[2] Frantz, D. K.; Baldridge, K. K.; Siegel, J. S.; *Chimia* **2009**, *63*, 201.
[3] Frantz, D. K.; Sullivan, A. A.; Yasui, Y.; Linden, A.; Baldridge, K. K.; Siegel, J. S. *Org. Biomol. Chem.* **2009**, *7*, 2347.

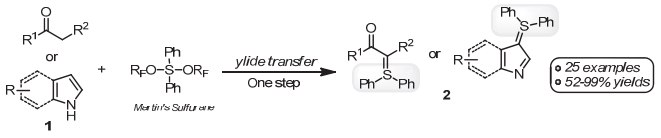
Organic Chemistry **OC 28**

Novel Transformations Mediated by Sulfur Reagents: From Ylide Transfer to Direct Arylation of Carbonyl Compounds

Xueliang Huang, Nuno Maulide*

Max-Planck-Institut für Kohlenforschung, Kaiser-Wilhelm-Platz 1, 45470 Mülheim, Germany

Sulfur ylides occupy a prominent place among so-called "textbook reagents" in organic chemistry.[1] Recently, they have also garnered interest as potential carbene donors for metal complexes.[2] Nevertheless, the standard syntheses of sulfur ylides are still multi(≥ 2)step procedures and applications in transition metal catalysis remain limited.[1]
We have developed a new concept of "ylide transfer" for the direct, one-step synthesis of sulfur ylides **2** from carbonyl and heteroaromatic compounds **1**.[3] In this communication, results from those studies will be presented. Furthermore, an intriguing alternative pathway that results in a powerful direct arylation of carbonyl compounds shall be disclosed and discussed.[4]



[1] a) M. B. Smith, J. March, *Advanced Organic Chemistry*; Wiley: New York, **2001** and references therein.
[2] See, *e.g.*: a) P. Müller, D. Fernandez, P. Nury, J.-C. Rossier, *Helv. Chim. Acta* **1999**, *82*, 935. b) M. Gandelman, B. Rybtchinski, N. Ashkenazi, R. M. Gauvin, D. Milstein, *J. Am. Chem. Soc.* **2001**, *123*, 5372. c) I. K. Mangion, I. K. Nwamba, M. Shevlin, M. A. Huffan, *Org. Lett.* **2009**, *11*, 3566.
[3] X. Huang, R. Goddard, N. Maulide, *Angew. Chem. Int. Ed.* **2010**, *49*, 8979; *Angew. Chem.* **2010**, *122*, 9163.
[4] X. Huang, N. Maulide, *submitted*.

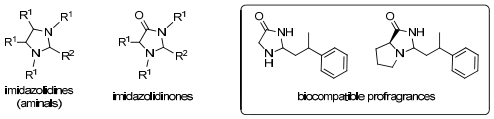
Organic Chemistry **OC 29**

Imidazolidinones as Biocompatible Precursors for the Controlled Release of Volatile Carbonyl Derivatives.

Andreas Herrmann,* Alain Trachsel, Barbara Buchs and Guillaume Godin

Firmenich SA, Division Recherche & Développement, B.P. 239, CH-1211 Genève 8, Switzerland.

1,3-Heterocyclic compounds have repeatedly been investigated as precursors to control the release of bioactive aldehydes or ketones upon hydrolysis. However, many of these precursors are too stable to efficiently release carbonyl compounds under mild reaction conditions at neutral pH. In the context of our recent studies to use the reversibility of imidazolidine (aminal) formation and hydrolysis to slow down the evaporation of volatile carbonyl compounds,[1] we have now investigated the potential of structurally related imidazolidinones as fragrance delivery systems.[2]



The preparation of imidazolidinones from commercially available biocompatible amino acid amide hydrochlorides was optimised and a series of precursors was prepared. Imidazolidinones were found to be considerably more stable than their aminal analogues. Nevertheless, dynamic headspace analysis showed that the precursors are suitable delivery systems for fragrance aldehydes and ketones. The efficiency of fragrance release was investigated as a function of the amino acid amide structure used for the derivatisation and the structure of the volatile carbonyl compound to be released.

[1] B. Buchs, G. Godin, A. Trachsel, J.-Y. de Saint Laumer, J.-M. Lehn, A. Herrmann, *Eur. J. Org. Chem.* **2011**, 681-695.
[2] A. Herrmann, G. Godin, WO 2008/142591, 2008.

Organic Chemistry **OC 30**

Signal Control by Self-Assembly of Fluorophores in a Molecular Beacon – A Model Study.

Sarah M. Biner, D. Kummer, V. L. Malinovskii, R. Häner

Department of Chemistry and Biochemistry, University of Bern Freiestrasse 3, CH-3012 Bern

The self-assembly of dialkynylpyrene (**Y**) and perylenediimide (**E**) units in a DNA has been studied by UV/Vis, circular dichroism and fluorescence spectroscopy. The chromophores were embedded in a molecular beacon (MB) type DNA sequence. In absence of the target the non-nucleosidic building blocks form an organized, multichromophoric complex. Hybridization of the MB towards its target results in a conformational reorganization of the chromophore aggregates. The nature of the aggregates was investigated by changing the number of chromophores and natural base pairs in the beacon stem. The formation of various types complexes (**E**Y**E**Y → Y**E**Y → **E**Y) is revealed by characteristic spectroscopic changes. The concept may find applications in various types of input/output systems using light as the source of information. [1] [2] [3]

MB1	5' GGTC YY CTA GAG GGG TCA GAG GAT **EE** GACC 3'
MB2	5' TC YY CTA GAG GGG TCA GAG GAT **EE** GA 3'
MB3	5' YY CTA GAG GGG TCA GAG GAT **EE** 3'
MB4	5' TC YY CTA GAG GGG TCA GAG GAT **E** GA 3'
MB5	5' GGTCT Y CTA GAG GGG TCA GAG GAT **E** AGACC 3'

[1] Tyagi S., Marras S. A. E., Vet J. A. M. and Kramer F. R. Molecular Beacons. www. molecular-beacons.org
[2] Häner R., Biner S. M., Langenegger S. M., Meng T., Malinovskii V. L., *Angew. Chem. Int. Ed.,* **2010**, *49*, 1227–1230.
[3] Biner S. M., Kummer D., Malinovskii V. L., Häner R., *Organic and Biomol. Chemistry.,* **2011**, *9*, 2628-2633.

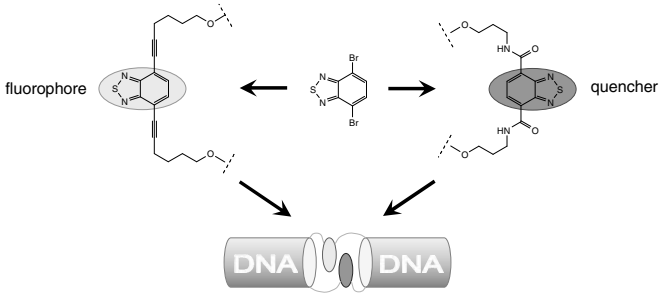
Organic Chemistry **OC 31**

A new fluorophore-quencher system based on 2,1,3-benzothiadiazole

Florian Garo and Robert Häner*

Departement of Chemistry and Biochemistry, University of Bern Freiestrasse 3, CH-3012 Bern

2,1,3-Benzothiadiazole (BTD) is well known as a strong electron acceptor. It is widely used in polymer science for the construction of solar cells [1] as well as for the selective detection of DNA [2].
Recently the attachment of a BTD derivative as DNA base surrogate and its use in oligodeoxyfluorosides (ODF) as labels for antibodies was achieved by Kool and coworkers [3].
We present the synthesis and the incorporation of new non-nucleosidic BTD-based building blocks into DNA oligomers and a study of the spectroscopic properties. Depending on the functionalities in the linker part, the BTD building block can act either as a fluorophore or as a quencher.



[1] Park S. H. et. al., *Nature Photonics* **2009**, 297-302.
[2] Liu B., Bazan G. C., *Proc. Natl. Acad. Sci. U. S. A.* **2005**, 589-593
[3] Guo J. et. al., *Proc. Natl. Acad. Sci. U. S. A.* **2011**, 3493-3498

Organic Chemistry **OC 32**

Targeted ε-base formation in nucleic acids

David Egloff, Eva Freisinger*

University of Zurich, Institute of Inorganic Chemistry, Winterthurerstr. 190, 8057 Zürich, Switzerland

Synthetic and in particular site-specifically modified nucleic acids are used for numerous applications nowadays such as antisense therapy, studies of biochemical pathways, elucidation of enzymatic mechanisms or structure determination of RNA and DNA [1]. Among these modifications ε-bases represent a very interesting target since they are related to carcinogenesis induced either by mutagens or by increased oxidative stress [2]. In addition, they show remarkable fluorescence properties. Even though the site-specific introduction of modifications into nucleic acids can be achieved successfully, the methods applied so far are restricted to short oligonucleotides due to low yields and extensive procedures [3].

Our goal is the site-specific generation of ε-bases in single stranded nucleic acids using a straight-forward approach that does not depend on the length of strands: A chemical analog of the ε-forming compound chloroacetaldehyde is linked to a DNA template with a desired base sequence (**A**). Due to the intrinsic base pairing properties of nucleic acids the template strand will then escort this reactive group to its target nucleotide on a complementary strand and thus trigger the site-specific conversion of the nucleobase to its corresponding ε-base (**B**).

[1] N. Venkatesan, S. J. Ki, B. H. Kim, *Curr. Med. Chem.* **2003**, *10*, 1973.
[2] A. Barbin, *Mutat. Res.* **2000**, *462*, 55.
[3] S. L. Beaucage, R. P. Iyer, *Tetrahedron* **1992**, *48*, 2223.

Financial support from the Swiss National Science Foundation is gratefully acknowledged (SNSF-Professorship PP002-119106/1 to EF).

Organic Chemistry **OC 33**

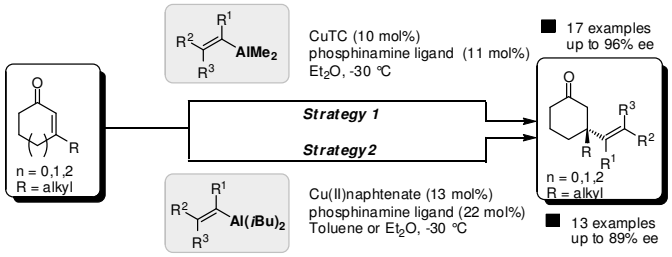
Formation of Vinyl Substituted Quaternary Carbon Stereogenic Centres Through Cu-catalyzed Asymmetric Conjugate Additions of Vinylaluminums to β-Substituted Cyclic Enones

Daniel Müller, Alexandre Alexakis*

Department of Organic Chemistry, University of Geneva,

30 Quai Ernest Ansermet, 1211 Geneve 4, Switzerland

Despite tremendous research efforts that have been made in the field of creation of quaternary stereogenic centres via conjugate addition reactions[1], the formation of such centres bearing a vinyl-substituent still remains a challenge. Recently, we developed two strategies to create vinyl-substituted quaternary stereogenic centers employing vinylalanes and a copper phosphinamine ligand complex.[2]



High enantioselectivities were afforded with a wide range of nucleophiles and substrates. Further applications are under current investigation.

[1] C. Hawner, A. Alexakis, *Chem. Commun.* **2010**, *46*, 7295–7306.

[2] D. Müller et. al Alexakis, *Synlett* **2010**, 1694–1698.

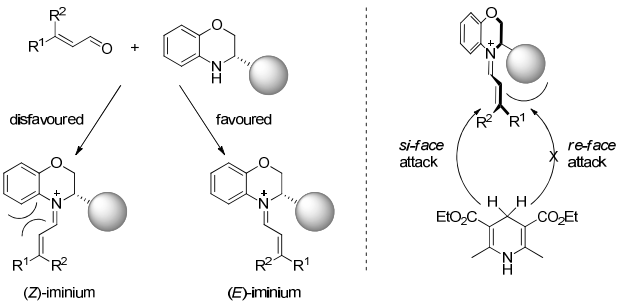
Organic Chemistry **OC 34**

Organo-Catalyzed Asymmetric Transfer-Hydrogenation of α,β-Unsaturated Aldehydes

Christian Ebner, Andreas Pfaltz*

University of Basel, Department of Chemistry, St. Johanns-Ring 19, 4056 Basel, Switzerland

The organocatalyzed transfer hydrogenation displays a very mild and efficient method for the reduction of α,β-unsaturated aldehydes. However, to date only very few examples of this reaction can be found in literature.[1] We developed a novel organocatalyst for this reaction based on dihydro benzo[1,4]oxazines. These catalysts are able to reduce substrates with very similar substituents in the β-position as for example β,β-diaryl enals. To date no examples for the reduction of this kind of substrates can be found in literature. Herein we present our initial results for the organocatalyzed transfer hydrogenation using our novel catalyst system including synthesis, mechanism, reaction optimization and reaction scope.



[1] for example see: a) S. G. Ouellet, J. B. Tuttle, D. W. C. MacMillan, *J. Am. Chem. Soc.* **2004**, *127*, 32; b) N. J. A. Martin, B. List, *J. Am. Chem. Soc.* **2006**, *128*, 13368.

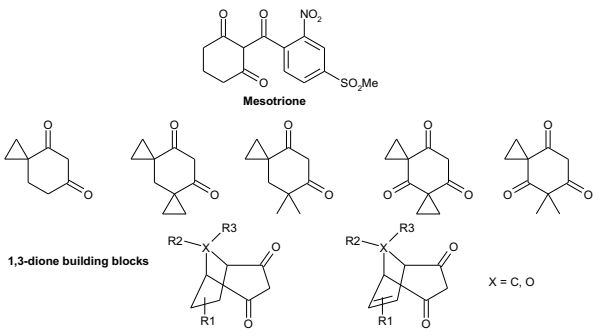
Organic Chemistry **OC 35**

New generation of 1,3-diones in the HPPD inhibitor Chemistry

Renaud Beaudegnies

Syngenta Crop Protection AG, Research Chemistry, Schaffhauserstr. 101, CH-4332 Stein, Switzerland

Triketone derivatives such as Mesotrione are potent herbicides which exert their action by the inhibition of hydroxyphenyl pyruvate deoxygenase (HPPD)(1). Inhibition of this enzyme leads to bleaching symptoms in plants by blocking the biosynthesis of plastoquinone, an essential co-factor for phytoene desaturase which in turn is required to protect plants from damage by singlet oxygen produced as a by-product of photosynthesis.
In our quest for the next generation of HPPD inhibitors, important issues remain to be addressed such as higher intrinsic biological activity and crop selectivity along with optimal soil degradation. It has been demonstrated that adequate substitution of the 1,3-dione scaffold can bring valuable solutions. New generation of 1,3-dione moieties has been investigated.
The challenging syntheses of these building blocks will be presented.



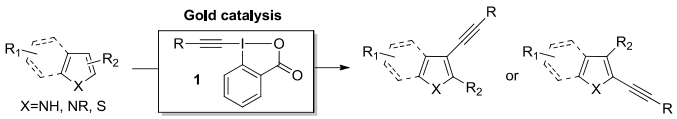
[1] Edmunds, A.J.F. in *Modern Crop Protection Compounds* Ed. by Krämer, W. and Schirmer, U.; Wiley-VCH **2007**, vol. 1, 221.

Organic Chemistry **OC 36**

Au-Catalyzed Alkynylation of Heterocycles using Hypervalent Iodine

J. P. Brand, Prof. Dr. J. Waser

Laboratory of Catalysis and Organic Synthesis, Ecole Polytechnique Fédérale de Lausanne, EPFL SB ISIC LCSO, BCH 4306, 1015 Lausanne.



In the framework of sustainable chemistry, an important research field has emerged recently focusing on the direct functionalization of C-H bonds.[1] Despite the importance of alkynes in organic synthesis, material science and biological chemistry, studies toward the direct alkynylation of heterocycles were scarce compared to arylation and vinylation, with only two examples reported before 2009. The situation changed completely since then, and several new alkynylation methods have been reported.[2]

Herein we report the unique properties of benziodoxolone alkynyl periodinane **1** in the presence of gold catalysts for the introduction of silylacetylenes on a large range of indoles, pyrroles and thiophenes with broad functional groups tolerance.[3] Recent investigations on the hypervalent iodine reagent structure and extension of the reaction scope will be presented.

[1] Alberico, D.; Scott, M. E.; Lautens, M. *Chem. Rev.* **2007,** *107*, 174.
[2] Messaoudi, S.; Brion, J. D.; Alami, M. *Eur. J. Org. Chem.* **2010**, 6495.
[3] a) Brand, J. P.; Charpentier, J.; Waser, J. *Angew. Chem. Int. Ed.* **2009**, *48*, 9346, b) Brand, J. P.; Waser, J. *Angew. Chem. Int. Ed.* **2010,** *49*, 7304.

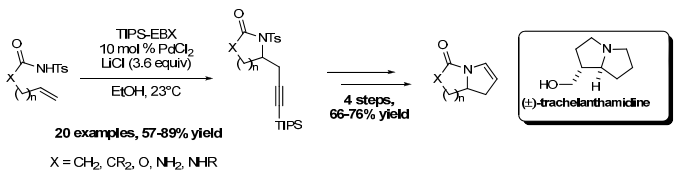
Organic Chemistry **OC 37**

Intramolecular Aminoalkynylation of Alkenes: a Novel Strategy Towards Pyrrolizidine and Indolizidine Heterocycles

Stefano Nicolai, Jérôme Waser*

Laboratory of Catalysis and Organic Synthesis, EPFL, 1015 Lausanne, Switzerland

Heterocycles are common structural motifs in both natural products and other biologically active compounds. Among them, pyrrolizidine and indolizidine alkaloids have been extensively studied for their potential pharmacological applications. Furthermore, their complex *N*-bridged structure has attracted much interest from the synthetic point of view.[1]
A novel strategy for the synthesis of pyrrolizidine and indolizidine heterocycles is reported herein.[2] Terminal olefins are initially subjected to Pd-catalyzed aminoalkynylation with hypervalent iodine reagent TIPS-EBX. This reaction readily permits the convertion of tosyl lactams, carbamates and ureas into the corresponding 5- and 6-member rings in very good to excellent yields and introduces the two lacking carbons for the formation of the second ring. After easy deprotection, these products can be efficiently cyclized by a simple two-step procedure to afford pyrrolizidine and indolizidine heterocycles. This strategy has been successfully used for the preparation of the natural product (±)-trachelantamidine.



[1] J. P. Michael, Nat. Prod. Rep. **2007**, *24*, 191.
[2] S. Nicolai, C. Piemontesi, J. Waser, *Angew. Chem., Int. Ed.* **2011,** *in press.*

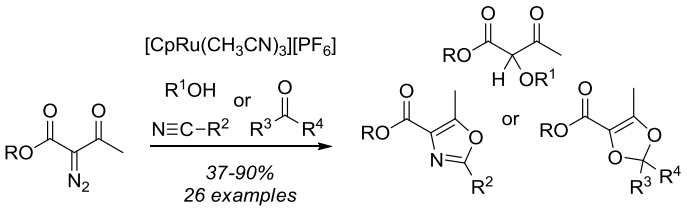
Organic Chemistry **OC 38**

CpRu-Catalysed O-H Insertion and Condensation Reactions of R-Diazocarbonyl Compounds

Cecilia Tortoreto, Martina Austeri, Diane Rix, Walid Zeghida and Jérôme Lacour*

Department of Organic Chemistry, University of Geneva
Quai Ernest Ansermet 30, 1211 Geneva 4, Switzerland

Cu(I), Cu(II) and Rh(II) salts or complexes are known to be particularly efficient for the decomposition of diazo derivatives.[1] However, other metal sources are active, and ruthenium complexes have become an interesting alternative, including CpRu derivatives.[2] Herein, we show that $[CpRu(CH_3CN)_3][PF_6]$ and diimine ligands catalyze together the decomposition of α-diazoacetoacetates leading to O-H insertion and condensation reactions with nitriles, ketones and aldehydes.[3] In comparison with Rh(II) and Cu(I) complexes, the CpRu catalysts produce rapid and often more selective reactions. Promising enantioselectivities are obtained in dioxole syntheses.



[1] Che, C.-M.; Huang, J.-S. *Coord. Chem. Rev*. **2002**, 231, 151. Maas, G. *Chem. Soc. Rev*. **2004**, 33, 183.
[2] Baratta, W.; Del Zotto, *A. Chem. Commun*. **1997**, 2163. Herrmann, W. A.; Kratzer, R. M.; Rigo, P. *Organometallics* **2000**, 19, 3664.
[3] Austeri, M.; Rix, D.; Zeghida, W.; Lacour, J. *Org. Lett.* **2011**, 13, 1394.

Organic Chemistry **OC 39**

Formation of supramolecular polymers by short pyrene oligomers

Alina L. Nussbaumer,[a] Daniel Studer,[b] Vladimir L. Malinovskii[a] and Robert Häner[a]

[a]Department of Chemistry, University of Bern, CH-3012 Bern, Switzerland
[b]Institute of Anatomy, University of Bern, CH-3000 Bern, Switzerland

A new type of supramolecular polymers formed by short oligomers of pyrenes (**α**), connected via flexible phosphodiester linkers, is presented.[1]
Performed "sergeant and soldiers" experiments show chiral amplification. By adding of small amount of chiral pyrene oligomer (**χ**) bearing a cytidine nucleotide highest anisotropy was observed (Figure1). These observations suggest the formation of supramolecular polymers. Supramolecular linear structures could be visualized by transmission electron microscopy.

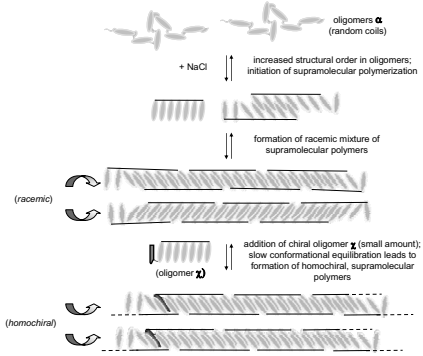


Figure 1: Proposed model for the formation of supramolecular polymers.

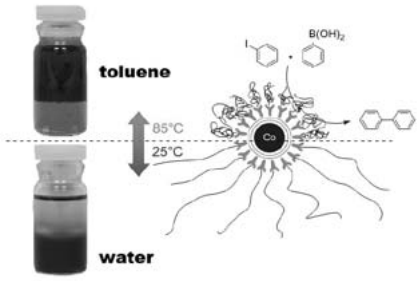
[1] A.L. Nussbaumer, D. Studer, V.L. Malinovskii, R. Häner *Angew. Chem. Int. Ed. accepted.*

Organic Chemistry **OC 40**

Self-separating Catalyst using Magnetic Nanoparticles combined with Thermoresponsive Polymers

Martin Zeltner, Alexander Schätz, Max L. Hefti and Wendelin J. Stark*

* Department of Chemistry and Applied Biosciences, Institute for Chemical and Bioengineering, ETH Zurich, CH-8093 Zurich, Switzerland



Metallic nanomagnets[1] are supposed to overcome the most tantalizing drawback in homogeneous catalysis, i.e. separation and recycling of often toxic and expensive transition metal complexes. We synthesized highly ferromagnetic, thermoresponsive nanomagnets with a graphene coated cobalt core to which amphiphilic *N*-isopropylacrylamide polymer branches were covalently attached. This novel hybrid material could be further modified with a Pd–phosphine complex to catalyze Suzuki–Miyaura cross-coupling reactions. The heterogenized metal-complex acted as a 'self-separating' catalyst. Thermally triggered switching of poly-NIPAM coated C/Co-nanoparticles in typical biphasic water/toluene reaction systems allowed for a controlled shift of the catalyst from the organic to water phase and back. This enabled catalysis in the organic layer (reaction temperature) and return into the aqueous layer once the reaction mixture was cooled (ambient temperature; magnetic removal and reuse of the catalyst). Thus, the product phase was isolated via simple extration/decantation. The supported catalyst was recycled from the aqueous phase by taking advantage of the magnetic cores and reused ten times.

[1] R. N. Grass, W.J. Stark, *J. Mater. Chem*, **2006**, *16*, 1825.

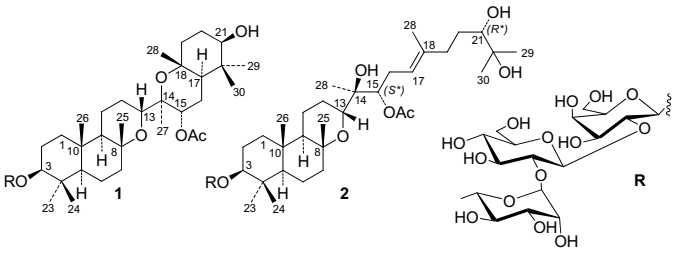
Organic Chemistry **OC 41**

Phyteumosides A and B : New saponins with unique triterpenoid aglycons from *Phyteuma orbiculare* L.

Christian Abbet[1], Markus Neuburger[2], Trixie Wagner[3], Melanie Quitschau[1], Matthias Hamburger[1], Olivier Potterat[1*]

[1]Pharmaceutical Biology, University of Basel, Klingelbergstrasse 50, 4056 Basel, Switzerland
[2]Inorganic Chemistry, University of Basel, Spitalstrasse 51, 4056 Basel, Switzerland
[3]Novartis Institutes for BioMedical Research, 4002 Basel, Switzerland

In a study of forgotten traditional food plants of the alpine regions, we investigated the aerial parts of the round-headed rampion (*Phyteuma orbiculare* L., Campanulaceae). Here, we report the isolation and structure elucidation of two new triterpene glycosides, phyteumosides A (**1**) and B (**2**), which possess unique triterpenic aglycons. Their structures were elucidated by spectroscopic and chemical methods, and were corroborated by X-ray diffraction analyses of the aglycons obtained after enzymatic hydrolysis.



The aglycon of **1** can be considered as an incompletely cyclized onoceroid or gammaceroid triterpene with two additional tetrahydropyran rings arising from oxygen bridges. Compound **2**, possesses a new 17-polypodene aglycon. Biosynthetically, both aglycons seem to derive from an unrearranged squalene molecule, which underwent incomplete cyclization.

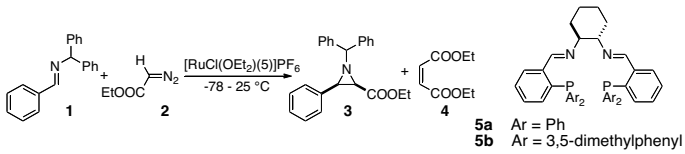
Organic Chemistry **OC 42**

Improving the Ru/PNNP–Catalyzed Asymmetric Imine Aziridination

Amata Schira, Antonio Mezzetti*

Dept. of Chemistry and Applied Biosciences, ETH Zürich, 8093 Zürich

Chiral aziridines are valuable synthons as precursors to amines with excellent stereo- and regiocontrol. Our group reported that [$RuCl_2$(**5a**)], after chloride abstraction with Et_3OPF_6 (1 equiv), catalyzes the asymmetric aziridination of imine **1** with ethyl diazoacetate (**2**). Aziridine **3** was obtained with high enantioselectivity (up to 87% ee), but with low yield (up to 26%) [1]. The low yield was due to the formation of diethyl maleate **4**, which was the only product at room temperature. On the basis of NMR spectroscopic studies, we proposed that the coordination of **2** to ruthenium gives a diazoester adduct that either transfers carbene to the imine or decomposes to a carbene complex, which is responsible for maleate formation.



We report here preliminary results with new PNNP ligands bearing *meta* substituents. Ligand **5b** gave the best results with up 70% yield, but the enantioselectivity was nearly lost (13% ee). However, as bulky ligands disfavor the decomposition of diazoester complexes to the corresponding carbene species [2], the yield enhancement with **5b** strongly supports the proposed mechanism. We are presently optimizing the reaction conditions to recover high enantioselectivity. Further spectroscopic and mechanistic studies of the carbene transfer to imine **1** will be presented.

[1] M. Ranocchiari, A. Mezzetti, *Organometallics*, **2009**, *28*, 3611.
[2] R. Cohen, B. Rybtchinski, M. Gandelman, H. Rozenberg, J. M. L. Martin, D. Milstein, *J. Am. Chem. Soc.* **2003**, *125*, 6532.

Organic Chemistry **OC 43**

New Chiral *N*-heterocyclic Carbene Borane Complexes

Dipshikha Banerjee, Céline Besnard, and E. Peter Kündig*

Department of Organic Chemistry, University of Geneva
30 quai Ernest Ansermet, CH-1211 Geneva 4, Switzerland

Over the last couple of decades *N*-heterocyclic carbenes (NHCs) have become of paramount importance in the field of transition metal catalyzed and and organocatalytic reactions.[1] We have recently reported a novel class of chiral NHCs (Figure 1) utilizing the concept of minimization of allylic strain to set the stereocontrol elements of the catalyst. These ligands have been very successfully applied in the intramolecular arylation of amides to give 3,3-disubstituted chiral oxindoles.[2]

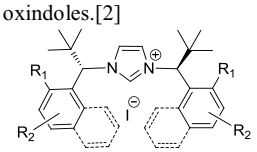


Figure: 1

Motivated by the recent upsurge for the NHC complexes of main group elements, we hereby report new family of chiral NHC-borane complexes and our investigations on their structural features.

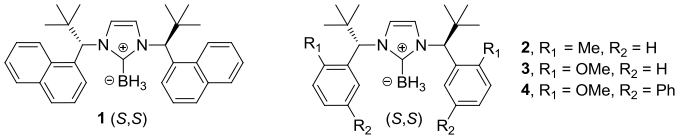


Figure: 2

[1] a) Marion, N.; Nolan, S. P. *Chem. Soc. Rev.* **2008**, *37*, 1776. b) Enders, D.; Niemlier, O.; Henseler, A. *Chem. Rev.* **2007**, *107*, 5606.
[2] Jia, Y.- X.; Katayev, D.; Bernardinelli, G.; Seidel, T. M.; Kündig, E. P. *Chem. Eur. J.* **2010**, *16*, 6300.

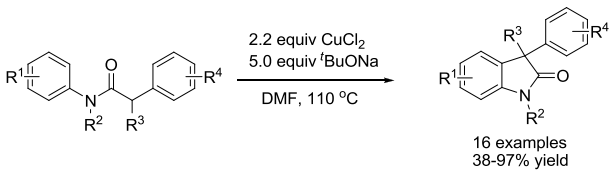
Organic Chemistry **OC 44**

Oxindole and Aza-oxindole Synthesis by Direct Coupling of Csp^2-H and Csp^3-H Centers

Chandan Dey, Yi-Xia Jia, and E. Peter Kündig*

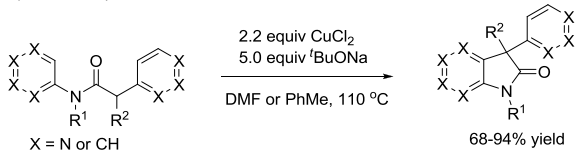
Department of Organic Chemistry, University of Geneva
30 quai Ernest Ansermet, CH-1211 Geneva 4, Switzerland

Oxindoles and aza-oxindoles are common and important substructures in natural products and biologically active molecules. A robust, cheap and efficient copper mediated Csp^2-H, Csp^3-H coupling method for the conversion of anilides into disubstituted oxindoles in high yields has been developed in our group (Scheme 1) [1]. The key step of this transformation is an intramolecular radical addition reaction



Scheme 1

Here we show that the copper mediated Csp^2-H, Csp^3-H coupling protocol gives access to aza-oxindoles and 3-pyridyl oxindoles in good to excellent yields (Scheme 2).



Scheme 2

[1] Jia, Y.- X.; Kündig, E. P. *Angew. Chem. Int. Ed.* **2009**, *48*, 1636.

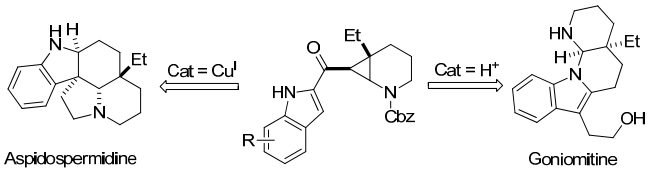
Organic Chemistry **OC 45**

Indole Alkaloids Synthesis via a Selective Cyclization of Aminocyclopropanes

Filippo De Simone and Jérôme Waser

EPFL, SB ISIC LCSO 1007 Lausanne, Switzerland

The presence of polyheterocyclic structures in most natural and synthetic drugs is well documented. The discovery of new efficient cyclization reactions is therefore important to access complex natural products and their analogs with potentially enhanced bioactivity.
We have recently reported the first catalytic formal homo-Nazarov cyclization of vinyl cyclopropyl ketones for the synthesis of cyclohexenones.[1] Herein we report the first application of our method in the cyclization of aminocyclopropanes. The power of our methodology resides in the selective cyclization on the N1 or C3 position of indole heterocycles simply achieved by changing catalyst and solvent. The copper catalyst favorized the N1 cyclization to give the tetracyclic core of aspidospermidine while a Brønsted acid catalyzed the C3 ring closing to form goniomitine's scaffold. The methodology was applied in the formal total synthesis of aspidospermidine and the total synthesis of goniomitine. [2]



[1] (a) De Simone, F.; Andres, J., Torosantucci, R. ; Waser, J. *Org. Lett.* **2009**, *11*, 1023. (b) F. De Simone, J. Waser, Synthesis 2009, 3353.
[2] (a) De Simone, F.; Gertsch, J.; Waser, J. *Angew. Chem., Int. Ed.*, **2010,** *49,* 5767. (b) De Simone, F.; Waser, J. *Synlett*, **2011,** *5,* 589.

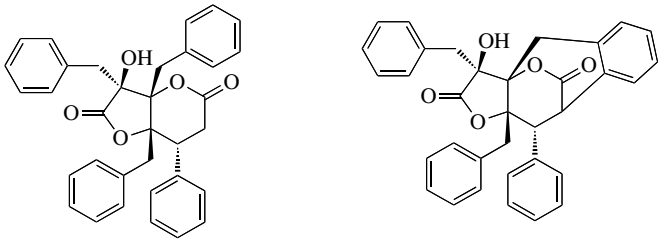
Organic Chemistry **OC 46**

Towards the Total Synthesis of Ophiodilactones A and B

Samuel Bader, Jean-Yves Wach, Karl Gademann*

University of Basel, Department of Chemistry, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

The tetrameric phenylpropanoids ophiodilactones A (**1**) and B (**2**) have been isolated from the starfish *Ophiocoma scolopendrina*. Both compounds showed cytotoxic activity against P388 murine leukemia cell lines [1]. This activity combined with their intriguing architecture led us to establish a program directed towards their synthesis.



1 **2**

Key challenges are posed by the three contiguous stereogenic centers, the dilactone moiety, and the unusual α-arylated lactone in compound **2**. We will present our synthetic achievements towards the total synthesis of ophiodilactone A.

[1] R. Ueoka, T. Fujita, S. Matsunaga, *J. Org. Chem.* **2009**, *74*, 4396.

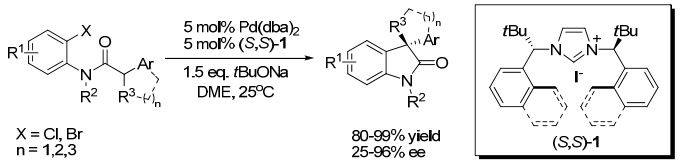
Organic Chemistry **OC 47**

Asymmetric Catalysis in 3,3-Disubstituted Oxindole Synthesis

Dmitry Katayev, Yi-Xia Jia, and E. Peter Kündig*

Department of Organic Chemistry, University of Geneva
30 quai Ernest Ansermet, CH-1211 Geneva 4, Switzerland

New chiral *N*-heterocyclic carbene (NHCs) ligands were developed and successfully applied in the asymmetric palladium-catalyzed α-arylation of amides, delivering 3,3-disubstituted- and spiro-oxindoles in high yield (80-99%) and excellent asymmetric efficiency (up to 96% *ee*) [1-2]. The high enantioselectivity of this process results from the feature of both, bulky *tert*-butyl groups at the stereogenic centers and *ortho*-aryl subsituents. The critical role of the *ortho*-aryl substituents was revealed in the crystal structures of palladacycle intermediates containing the chiral NHC ligands (*S,S*)-**1** and the substrate. The place and orientation of the ligand aryl groups are fixed by the minimization of allylic ($A^{1,3}$) strain providing optimal transfer of chiral information . This promoted the synthesis and the use of new improved ligands **1**, as reported in this communication. New findings also include spyrocyclic enantioenriched oxindoles and mechanistic studies of this transformation. The latter reveal the importance of alkene additives to increase turn-over number and turn-over frequency. Kinetic studies show the reaction to be first order in substrate.



[1] Jia, Y.-X., Hillgren, J. M., Watson, E. L., Marsden, S. P., Kündig, E. P. *Chem. Commun.* **2008**, 4040.
[2] Jia, Y.-X., Katayev, D., Bernardinelli, G., Seidel, T. M., Kündig, E. P. *Chem. Eur. J.* **2010**, *16,* 6300.

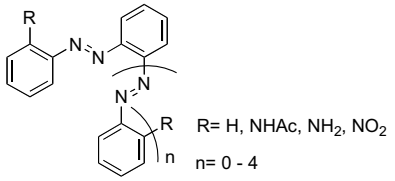
Organic Chemistry **OC 48**

Synthesis and Photoisomerization of Oligo-*ortho*-azobenzenes

Silvia Bellotto, Raphael Reuter, Christian Heinis, Hermann A. Wegner

University of Basel, Petersplatz 1, CH-4051 Basel, Switzerland
EPFL, Route Cantonale, CH-1015, Lausanne, Switzerland

Since their discovery in the nineteenth century, azocompounds have been used as dyes and pigments.[1] We became intereseted in these molecules because of their photoisomerisation property [2]. Indeed photoswitchable compounds are exploited to induce structural changes in molecules and there with, control their properties and function [3].
Although monomeric azobenzenes have been thoroughly investigated [1], the influence of conjugated azobenzene units on the photochemical properties has only been scarcely addressed. With this report we will close this gap for oligo-*ortho*-azobenzenes. Several 2,2'-dinitrogen-substituted, 2,2''-dinitrogen-bis-substituted and 2,2'''-di-substitued tris-*ortho*-azobenzenes have been synthesized using the Mills reaction. For all the compounds the photoisomerisation property have been studied which revealed a strong influence of the substitution pattern on their photoswitching.



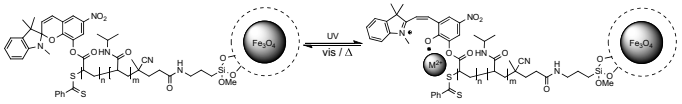
[1] J. Griffiths, *Chem Soc. Rev.* **1972**, 1, 481.
[2] R. Reuter, N. Hostettler, M. Neuenburg, H. A. Wegner, *Eur. J. Org. Chem.* **2009**, 5647; R. Reuter, H. A. Wegner, *Chem. Eur. J.*, **2011**, *17*, 2987.
[3] K. G. Yager, C. J. Barrett, *J. Photoch. Photobiol. A.* **2006**, *182*, 250.

Organic Chemistry **OC 49**

Light-driven Heavy Metal Extraction from Water

Jonas Halter, Alexander Schätz, Martin Zeltner, and Wendelin J. Stark*

* Department of Chemistry and Applied Biosciences, Institute for Chemical and Bioengineering, ETH Zurich, CH-8093 Zurich, Switzerland



Recently, photoswitchable spiropyrans gained attention as chelators for the extraction of metal salts in biphasic systems. The light-induced reversibility of this chelation process allowed for a controlled extraction of heavy metal salts out of contaminated solutions and subsequent enrichment in organic solvents.[1] Activation of the spiropyran moiety occurs upon UV irradiation, thus creating the zwitterionic merocyanine which is suitable for extraction. The back-reaction and liberation process is triggered by visible light or in the dark (thermal). A solid-phase supported version as alternative for biphasic extraction has yet to be reported. To this end, spiropyranes were copolymerized with poly-*N*-isopropylacrylamide (PNIPAM) onto magnetite nanoparticles. PNIPAM is an amphiphilic polymer which grants good dispersibility of the nanoparticles in water. The advantage of magnetic nanoparticles lies in their big surface area and the ease of separation with a permanent magnet. Altogether, nanoparticle-systems might be an alternative to biphasic separations with spiropyrans.

[1] J. D. Winkler, K. Deshayes, B. Shao, *J. Am. Chem. Soc.* **1989**, *111*, 769.

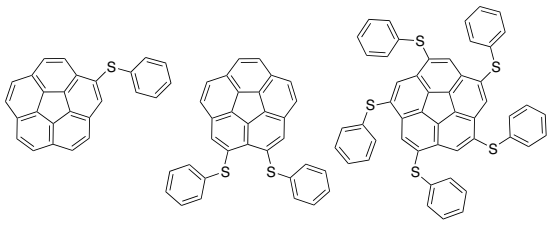
Organic Chemistry **OC 50**

Tunable Redox Properties of *n*-(Phenylthio)corannulenes

Angela Steinauer, Anna M. Butterfield, Anthony Linden, Kim K. Baldridge, Jay S. Siegel*

Organic Chemistry Institute, University of Zurich, Winterthurerstrasse 190, 8057 Zürich, Switzerland

A series of *n*-(phenylthio)corannulene derivatives has been synthesized from their halogenated precursor analogues, all of which exhibit interesting electronic properties. In fact, different numbers of phenylthio substituents make it possible to tune redox properties of corannulene [1]. Moreover, the higher substituted forms show reduction potentials that come close to that of their parent molecule C_{60} [2, 3]. Therefore, the range between the unsubstituted corannulene and the fully substituted decakis(phenylthio)corannulene was investigated. Photophysical properties, charge transfer bands, as well as ab initio calculations are reported.



[1] Seiders, T. J.; Baldridge, K. K.; Siegel, J. S.; Gleiter, R. *Tet. Lett.* **2000**, *41*, 4519.
[2] Baldridge, K. K.; Hardcastle, K. I.; Seiders, T.J.; Siegel, J. S. *Org. Biomol. Chem.* **2010**, *8*, 53.
[3] Arias, F.; Xie, Q.; Wu, Y.; Lu, Q.; Wilson, S. R.; Echegoyen, L. *J. Am. Chem. Soc.* **1994**, *116*, 6388.

Organic Chemistry **OC 51**

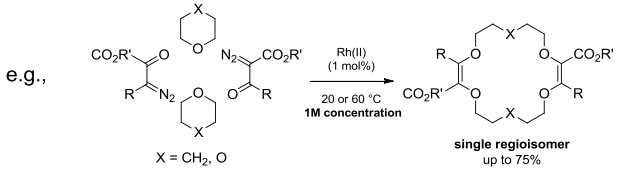
One-Step Synthesis of Functionalized Polyether Macrocycles

Mahesh Vishe, Diane Rix, Rafael Ballesteros Garrido, Walid Zeghida, Jérôme Lacour *

Department of Organic Chemistry, University of Geneva, Quai Ernest Ansermet 30, CH-1211 Geneva.

Macrocycles are generally synthesized from linear molecules using intramolecular reactions.[1] So far, to our knowledge, one-step syntheses of functionalized polyether macrocycles by multi-condensation reactions of four readily available building blocks are rare, even more under high concentration and non-templated conditions.

Here we present a series of Rh(II)-catalyzed [2] reactions of diazocarbonyls and cyclic ethers (i.e. oxetanes, 1,4 dioxanes, tetrahydropyranes, tetrahydro-furanes) that afford 15- to 18-membered macrocycles in a single step in yields up to 84 %.[3] Mechanistic rationals of these macrocyclisation reactions will be presented.



[1] H. An, J. S. Bradshaw, R. M. Izatt, *Chem. Rev.* **1992**, *92*, 543.
[2] M. P. Doyle, M. A. McKervey, T. Ye, Modern Catalytic Methods for Organic Synthesis with Diazo Compounds: From Cyclopropanes to Ylides; Wiley: New York, 1998.
[3] W. Zeghida, C. Besnard, J. Lacour, *Angew. Chem. Int. Ed.* **2010**, *49*, 7253; D. Rix, R. Ballesteros Garrido, W. Zeghida, C. Besnard, J. Lacour, *submitted.*

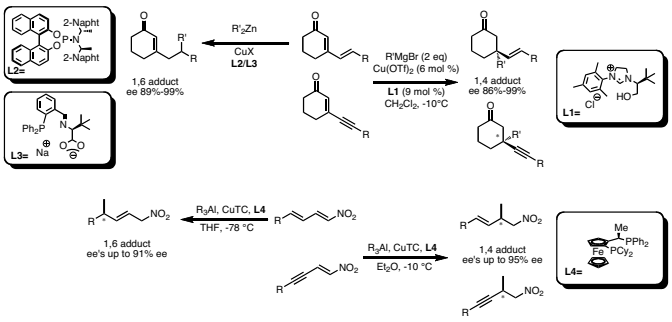
Organic Chemistry **OC 52**

Copper catalysed conjugate addition of organometallic reagents to extended Michael acceptors

Matthieu Tissot, Hélène Henon, Marc Mauduit*, Alexandre Alexakis*

University of Geneva, 30, quai Ernest Ansermet, 1211 Genève, Switzerland

Herein, we describe unexpected results in terms of regioselectivity with respect to copper catalysed conjugate addition of various organometallic reagents to different extended Michael acceptors. Substrate design or fine tuning of the reaction conditions can selectively lead to the 1,4 or the 1,6 adduct with high enantioselectivities.



[1] Henon, H.; Mauduit, M.; Alexakis, A. *Angew. Chem., Int. Ed.* **2008**, *47*, 9122.
[2] Tissot, M.; Müller, D.; Bulot, S.; M.; Alexakis, A. *Org. Lett.* **2010**, *12*, 2770.
[3] Wencel-Delord, J.; Alexakis, A.; Crévisy, C.; Mauduit, M. *Org. Lett.* **2010**, *12*, 4335.
[4] Tissot, M.; Pérez Hernandez, A.; Müller, D.; Mauduit, M.; Alexakis, A. *Org. Lett.* **2011**, *13*, 1524.

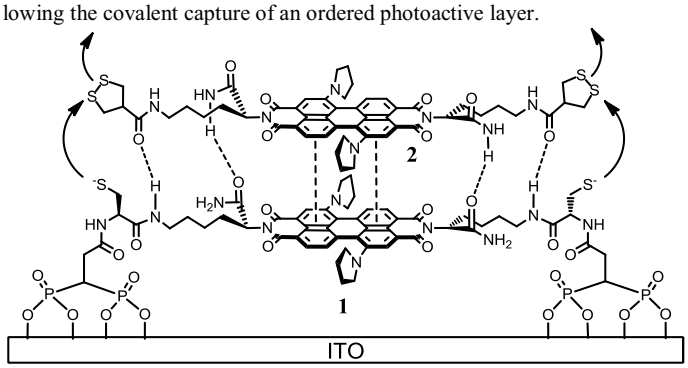
Organic Chemistry **OC 53**

Self-Organized Surface Initiated Polymerization of Perylenediimides on Indium Tin Oxide Surfaces

Pierre Charbonnaz, Naomi Sakai and Stefan Matile*

Department of Organic Chemistry, University of Geneva, Geneva, Switzerland.

In the context of developing new processes for the manufacturing of organic photovoltaic devices, self-organizing surface initiated polymerization (SOSIP) ([1]) is introduced as a way to functionalize indium tin oxide (ITO)-covered glass surfaces with perlylene diimide (PDI) chromophores. Initiator **1** readily forms a self-assembled monolayer on ITO through its phosphonic acid "feet". Free thiols are then released upon treatment with dithiothreitol (DTT); surface initiated polymerization of propagator **2** is finally run in basic conditions. π-π Interactions between initiator and propagator as well as hydrogen bonding capabilities preorganize the molecules, allowing the covalent capture of an ordered photoactive layer.



[1] M. Lista, N. Sakai, O. Kel, J. Areephong, S. Sakurai, D. Emery, J. Mareda, E. Vauthey and S. Matile, *submitted*.

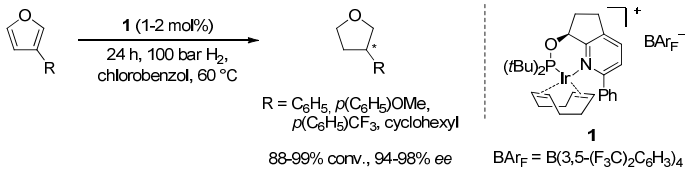
Organic Chemistry **OC 54**

Iridium-Catalyzed Hydrogenation of 3-Substituted Furans

Larissa Pauli, Andreas Pfaltz*

Department of Chemistry, University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

The stereoselective hydrogenation of heteroaromatics displays a promising method for the synthesis of chiral fully saturated heterocycles, representing important scaffolds in biologically active compounds[1]. Although enantiomerically pure tetrahydrofuran units are present in many pharmaceutical products, the asymmetric hydrogenation of the corresponding furans is scarcely studied.[2] So far, the reduction of mono- and disubstituted furans has been realized using catalysts based on ruthenium and rhodium complexes leading to enantiomeric excess of 50% and 77%, respectively[3] and our group has recently communicated the highly enantioselective reduction of 2-substituted furans using iridium based catalysts.[4] This contribution, describes the use of iridium complexes with chiral N,P ligand for the catalytic asymmetric hydrogenation of 3-substituted furans.



[1] J. P. Wolfe, *Eur. J. Org. Chem.* **2007**, *4*, 571.
[2] Y.-G. Zhou, *Acc. Chem. Res.* **2007**, *40*, 1357.
[3] a) T. Ohta, T. Miyake, N. Seido, H. Kumobayashi, H. Takaya, *J. Org. Chem.* **1995**, *60*, 357; b) M. He, D.-Q. Zhou, H.-L. Ge, M.-Y. Huang, Y.-Y. Jiang, *Polym.Adv. Technol.* **2003**, *14*, 273.
[4] S. Kaiser, S. P. Smidt, A. Pfaltz, *Angew. Chem. Int. Ed.* **2006**, *45*, 5194.

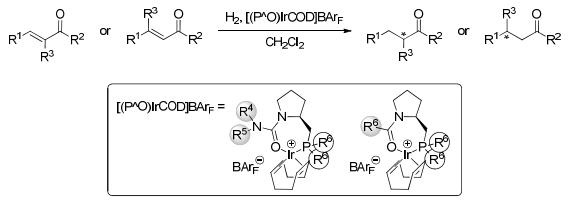
Organic Chemistry **OC 55**

Iridium Catalyzed Asymmetric Hydrogenation of Trisubstituted Functionalized Olefins using Amido- and Ureaphosphines as Ligands

Denise Rageot and Andreas Pfaltz*

University of Basel, Department of Chemistry, St. Johanns-Ring 19, 4056 Basel, Switzerland

Heteroatom based bidentate ligands are ubiquitous in the field of asymmetric catalysis.[1-2] However, only a few ligands which coordinate to a transition metal through an oxygen carbonyl atom have been reported.[3] Inspired by this coordination structure, we have synthesized a library of simple bidentate chiral P,O ligands based on *L*-Proline. In order to ascertain the performance of these novel ligands in the iridium catalyzed asymmetric hydrogenation, we screened several common substrates.



Excellent conversions and enantiomeric excesses up to 98% were obtained when amidophosphines or ureaphosphines were employed as ligands in the iridium catalyzed asymmetric hydrogenation of trisubstituted α,β-unsaturated esters. The synthesis of these P,O ligands and their application in hydrogenation studies will be presented.

[1] T. L. Church, P. G. Andersson, *Coord. Chem. Rev.* **2008**, *252*, 513.
[2] S. J. Roseblade, A. Pfaltz, *Acc. Chem. Res.* **2007**, *40*, 1402.
[3] M. Kuriyama, K. Nagai, K.-i. Yamada, Y. Miwa, T. Taga, K. Tomioka, *J. Am. Chem. Soc.* **2002**, *124*, 8932.

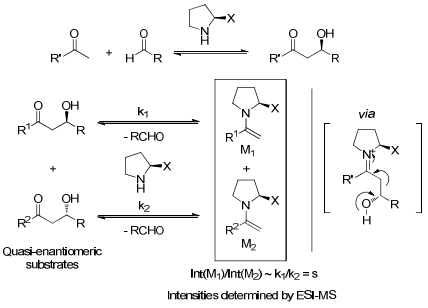
Organic Chemistry **OC 56**

Screening of Chiral Organocatalysts for the Aldol Reaction by Mass Spectrometric Monitoring of the *Retro* Reaction

Florian Bächle, Andreas Pfaltz*

University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

Recently we developed in our group a new screening method for the determination of the intrinsic enantioselectivity of chiral catalysts based on electrospray mass spectrometry and mass-labeled quasi-enantiomeric substrates [1]. This method was also successfully applied to organo-catalyzed asymmetric Diels-Alder [1][2] and Michael reactions [3] by monitoring of the back reaction.
Herein we present our initial results for the application of this method to organo-catalyzed aldol reactions. In contrast to our previous studies in which the iminium ion was the key intermediate for ESI-MS analysis, the aldol reactions proceed *via* enamines which are more challenging to visualize.



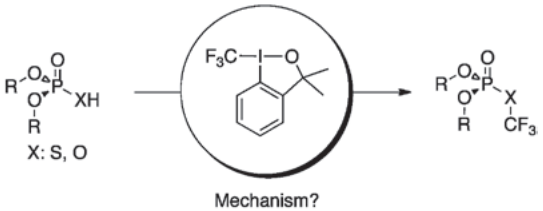
[1] C. A. Müller, C. Markert, A. M. Teichert, A. Pfaltz, *Chem. Commun.* **2009**, 1607.
[2] A. Teichert, A. Pfaltz, *Angew. Chem. Int. Ed.* **2008**, *47*, 3360.
[3] I. Fleischer, A. Pfaltz, *Chem. Eur. J.* **2010**, *16*, 95.

Organic Chemistry **OC 57**

Electrophilic Trifluoromethylation of Hydrogen Phosphates & *S*-Hydrogen Phosphorothioates - A Kinetic Comparison

N. Santschi, P. Geissbühler, A. Togni*

Department of Chemistry and Applied Biosciences, Swiss Federal Institute of Technology, ETH Zürich, CH-8093 Zürich, Switzerland



Phosphates are ubiquitous in nature and are, for example, found in DNA and RNA backbones. We have recently reported the electrophilic trifluoromethylation of *S*-hydrogen phosphorothioates, precurors to bioisosters of phosphates.[2] As an extension of this work we considered the electrophilic trifluoromethylation of hydrogen phosphates and probed their reactivity by means of initial rates determined through ^{19}F NMR monitoring of peusdo first order setups. As for *S*-hydrogen phosphorothioates a strong inductive influence on the reactivity was found by a Taft analysis.[3] A mechanistic proposal will be presented and conclusions concerning the differences in reactivity between *S*-hydrogen phosphorothioates and hydrogen phosphates will be drawn.

[1] a) Eisenberger, P.; Gischig, S.; Togni, A. *Chem. Eur. J.* **2006**, *12*, 2579. b) Kieltsch, I.; Eisenberger, P.; Togni, A. *Angew. Chem. Int. Ed.* **2007**, *46*, 754.
[2] Santschi, N.; Togni, A *J. Org. Chem.* **2011,** *asap.*
[3] a) Taft, R.W. *J. Am. Chem. Soc.* **1952**, *74*, 2729. b) Taft, R.W. *J. Am. Chem. Soc.* **1952**, *74*, 3120.

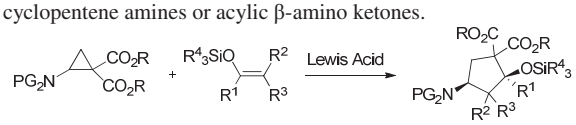
Organic Chemistry **OC 58**

Diastereoselective Formal [3+2] Cycloaddition of Aminocyclopropanes with Silyl Enol Ethers.

de Nanteuil Florian, Waser Jerôme*

Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland;

Donor-Acceptor cyclopropanes are powerful and versatile building blocks for organic synthesis as they leads to a reactive formal 1,3 dipole intermediates.[1,2] Consequently, their use as homologous olefin equivalents in diverse annulation processes is now well-established. Recently, impressive progress has been realized in catalytic reactions involving cyclopropanes substituted with oxygen or aryl donor substituents[3].
When considering the importance of nitrogen-containing functional groups in drugs and natural products, it is surprising that donor-acceptor aminocyclopropanes were never used in formal cycloaddition reactions. Through Lewis-Acid activation, we report herein the first catalytic formal [3+2] cycloaddition of aminocyclopropane with silyl enol ethers. Complete control over the diastereoselectivity of the reaction was achieved and the obtained aminocyclopentanes are useful constrained γ-amino-acids derivatives[4]. Further functionalization gave access to equally important cyclic amino alcohols, cyclopentene amines or acylic β-amino ketones.



1) Reissig, H-U.; Zimmer, R. *Chem. Rev*. **2003**, *103*, 1151-1196.
2) de Simone, F.; Waser, J. *Synthesis*. **2009**, 3353-3374.
3) (a) Campbell, M. J.; Johnson, J. S.; Parson, A.T.; Pohlhaus, P. D.; Sanders, S. D. *J. Org. Chem*. **2010**, *75*, 6317–6325 (b) Grover, H. K.; Lebold, T. P.; Kerr, M. A. *Org. Lett*. **2011**, *13*, 220–223 (c) de Simone, F.; Andres, J.; Torosantucci, R.; Waser, J. *Org. Lett*. **2009**, *11*, 1023-1026
4) Ordonez, M.; Cativiela, C. *Tetrahedron Asymmetry*, **2007**, *18*, 3-99

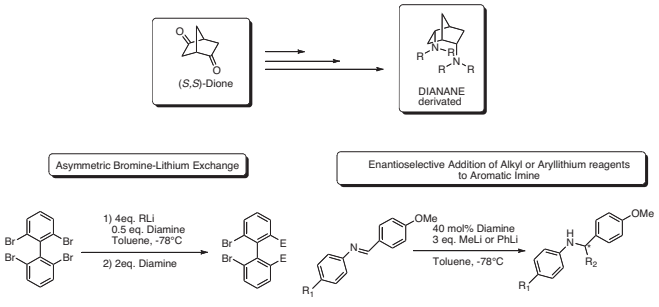
Organic Chemistry **OC 59**

New chiral tertiary C_2 symmetric diamines derived from DIANANES as chiral ligands

Praz Jézabel Albrecht Berkessel* and Alexandre Alexakis*

University of Geneva, 30 Quai Ernest-Ansermet, CH-1211 Geneva
University of Köln, 4 Greinstrasse, D-50939 Köln, Germany

Chiral diamines are compounds of greatest interest in organic synthesis and particularly as chiral ligands for various asymmetric reactions.
Our groups recently developed a new type of C_2-symmetric tertiary diamines derived from the DIANANE backbone. [1]
In these 1,4 diamines the chiral information is transferred to the stereogenic nitrogen that becomes upon chelation with a metal. The validity of this concept was illustrated in various reactions such as asymmetric bromine-lithium exgange, enantioselective additions of aryl and alkyllithium reagents to aromatic imines. [2]



[1] M. Schörder, C. A. Sklorz, S. Tabanella, N. Vogl, J. Lex, J. Neudörfl and A. Berkessel, *J.Org. Chem*., **2004**, *69*, 3050-3056.
[2] J. Praz and A. Alexakis, *Unpublished results.,* **2011**.

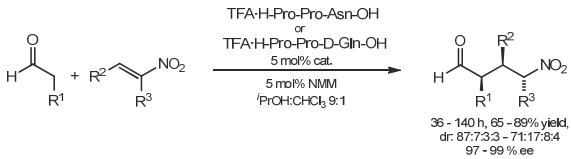
Organic Chemistry **OC 60**

Peptide Catalyzed 1,4-Addition Reactions of Aldehydes to α,β-Disubstituted Nitroolefins

Jörg Duschmalé, Helma Wennemers

Department of Chemistry - University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

Whereas β-mono-substituted nitroolefins are omnipresent as electrophiles in organocatalysis, α,β-disubstituted nitroolefins are widely underexamined due to their significantly lower reactivity. Here, we show that tripeptides of the type Pro-Pro-Xaa (Xaa = acidic amino acid)[1,2] allow for reaction of aldehydes with these less reactive nitroolefins.



The present work demonstrates that the large structural and functional diversity of small peptides combined with their low molecular weight offers intrinsic advantages compared to regular organocatalysts. While maintaining an original lead structure (Pro-Pro-Xaa), the straightforward introduction of diversity offers the possibility to adapt to substrate requirements. Thus, peptide catalysts are powerful tools for more demanding substrate combinations.

[1] M. Wiesner, J. D. Revell, H. Wennemers, *Angew. Chem. Int. Ed.* **2008**, *47*, 1871-1874.
[2] M. Wiesner, G. Upert, G. Angelici, H. Wennemers, *J. Am. Chem. Soc.* **2010**, *132*, 6-7.

Organic Chemistry **OC 61**

Reactivity of Strained System in the Alkyne Cyclotrimerization

Anne-Florence Stoessel[1], Jonathan Basler[1], Hermann A. Wegner[1]

[1]Department of Chemistry, University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

The [2+2+2] cycloaddition is an elegant strategy to install substituted aromatic rings in one step.[1] The reactivity of linear and strained systems towards alkyne cycloaddition reactions was investigated. An optimized protocol using $Rh(PPh_3)_3Cl$ as catalyst under microwave irradiation, was developed. The reaction of linear α,ω-diyne with monoyne under those conditions afforded the aromatic compound in good to very good yield for a range of monoyne and diynes. When those conditions were applied on strained system, a surprizing [2+2+1] cycloaddition reaction was observed instead.[2] The scope of this reaction is investigated and a mechanism for this unusual reaction is proposed.

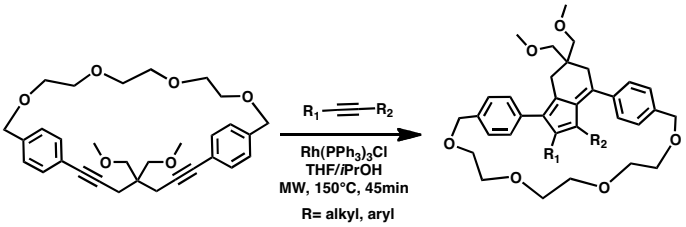


Figure 1 : Cycloaddition reaction on a strained molecule.

[1] S. Saito, Y. Yamamoto, *Chem. Rev.*, **2000**, *100* (8), 2901; B. Galan, T. Rovis, *Angew. Chem. Int. Ed.*, **2009**, *48* (16), 2830.
[2] A.-F. Stoessel, J. Basler, H. A. Wegner, *in preparation*.

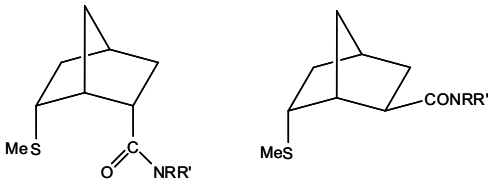
Organic Chemistry **OC 62**

Neighboring Amide Effect in Thioether Oxidation

T. Nauser,[a] R. S. Glass,[b] C. Schöneich,[c] W. H. Koppenol[a]

[a] Departement für Chemie und Angewandte Biowissenschaften, Wolfgang-Pauli-Str. 10, ETH Zürich (CH); [b] Department of Chemistry and Biochemistry, The University of Arizona, Tucson (USA); [c]Department of Pharmaceutical Chemistry, The University of Kansas, Lawrence (USA)

The thioethers **1** and **2** have been oxidized by one electron oxidants. As the structures suggest, only **1** can form an intramolecular two center three electron (2c3e) bond between sulfur and oxygen. Such 2c3e bonds can considerably stabilize a thioether radical cation and we have confirmed their presence in a radical cation of **1** as well their absence in the case of **2** by time-resolved UV spectroscopy.



1: R, R' = $-(CH_2)_4-$ **2**, R, R' = $-(CH_2)_4-$

Experiments with redox indicators show, that **1**, but not **2,** can be oxidized with hexachloridoiridate(2-), E°($[IrCl_6]^{2-}/[IrCl_6]^{3-}$) = 0.87 V. The electrode potential of the 2c3e bond stabilized thioether radical cation of MetGly is around 1.42 V [1]. The 2c3e bonded thioether radical cation in **1** is therefore stabilised approximately 0.6 V compared to that in MetGly [1].

[1] Prütz, W.A. et al, *Int. J. Radiat. Biol.*. **1989**, 55, 539.

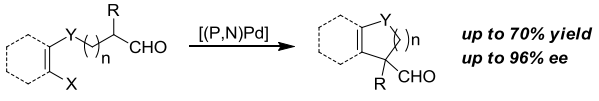
Organic Chemistry **OC 63**

Palladium-Catalyzed Asymmetric α-Arylation of Aldehydes

Pradeep Nareddy, Luca Mantilli, Clément Mazet*

Department of Organic Chemistry, University of Geneva
30 Quai Ernest Ansermet, 1211 Geneva, Switzerland
E-mail: Clement.Mazet@unige.ch

Our group has an interest in developing catalytic methods to access chiral aldehydes in view of further use in synthesis. In this context, we have recently developed an asymmetric isomerization of primary allylic alcohols [1] and an asymmetric hydroboration of terminal alkenes [2]. Although, high levels of enantioinduction were obtained for both reactions, none of these methods provides α-chiral aldehydes with a quaternary stereocenter. The underdeveloped Pd-catalyzed α-arylation of aldehydes pioneered by Miura [3] is an attractive strategy to access such motifs [4].



n = 1, 2; X = Br, I; Y = O, NH; R = alkyl, aryl

We will present the synthesis of an original class of chiral (P,N) ligands which, in combination with the proper palladium source, display unprecedented selectivity levels for the intra-molecular arylation of α-substituted aldehydes.

a) L. Mantilli, D. Gérard, S. Torche, C. Besnard, C. Mazet, *Angew. Chem. Int. Ed.* **2009**, *48*, 5143; b) L. Mantilli, C. Mazet, *Chem. Commun.* **2010**, *46*, 445; c) L. Mantilli, D. Gérard, S. Torche, C. Besnard, C. Mazet, *Chem. Eur. J.* **2010**, *16*, 12736.
C. Mazet, D. Gérard, *Chem. Commun.* **2011**, *47*, 298.
Y. Terao, Y. Fukuoka, T. Satoh, M. Miura, M. Nomura, *Tetrahedron Lett.* **2002**, *43*, 101.
J. García-Fortanet, S. L. Buchwald, *Angew. Chem. Int. Ed.* **2008**, *47*, 8108.

Organic Chemistry **OC 64**

Phytochemical profiling of *Sideroxylon obtusifolium*

Adriana Passos Oliveira, Melanie Quitschau, Matthias Hamburger, Olivier Potterat*

Pharmaceutical Biology, University of Basel, Klingelbergstrasse 50, CH-4056 Basel, Switzerland

Sideroxylon obtusifolium (Roem. & Schult.) T. D. Penn. belonging to the family Sapotaceae is a tree endemic to the Brazilian Sand Coast and Caatinga. Infusions of the bark and the leaves have been used in Brazilian folk medicine as anti-inflammatory agent [1]. Despite its medicinal applications, information on the constituents of *S. obtusifolium* remains scarce and only common pentacyclic triterpenoids have been previously reported [2].
HPLC-DAD/MS analyses revealed that saponins and flavonoids were the main constituents of the leaves. From the butanol-soluble fraction of an ethanolic extract a total of four saponins and ten flavonol glycosides were isolated by a combination of chromatographic methods including Sephadex LH-20, MPLC and HPLC. Their structures were established by acid hydrolysis and spectroscopic methods, mainly MS^n, 1D and 2D-NMR experiments. The compounds include the new triterpene glycosides 3-*O*-(*β*-D-glucopyranosyl)-28-*O*-(*α*-L-rhamnopyranosyl-(1→3)-*β*-D-xylopyranosyl-(1→4)-[D-apiofuranosyl-(1→3)]-*α*-L-rhamnopyranosyl-(1→2)-α-L-arabinopyranosyl)-protobassic acid and 3-*O*-(*β*-D-glucopyranosyl)-28-*O*-(L-apiofuranosyl-(1→3)-*β*-D-xylopyranosyl-(1→4)-[D-apiofuranosyl-(1→3)]-*α*-L-rhamnopyranosyl-(1→2)-*α*-L-arabinopyranosyl)-protobassic acid, as well as the new flavonol glycosides, quercetin 3-*O*-[*α*-L-rhamnopyranosyl-(1→2)-*β*-D-glucopyranosyl-(1→3)-*β*-D-galactopyranoside] and kaempferol 3-*O*-[*α*-L-rhamnopyranosyl-(1→2)-*β*-D-glucopyranosyl-(1→3)-*β*-D-galactopyranoside]. The isolated compounds could be used in future as markers for drug quality control.

[1] U. P. Albuquerque, R. F. Oliveira, *J. Ethnopharmacol.* **2007**, *113*, 156.
[2] T. Nakano, M. Hasegawa, *Planta Med.* **1975**, *27*, 89

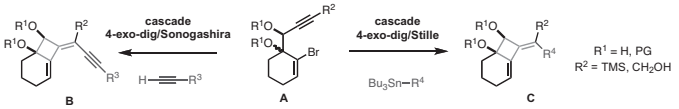
Organic Chemistry **OC 65**

New cascades for the synthesis of complex polycycles: 4-*exo*-dig cyclocarbopalladation followed by a coupling reaction

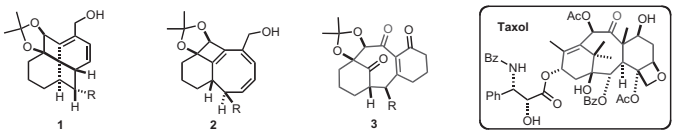
A. Boudhar, J. Petrignet, M. Charpenay, G. Blond, J. Suffert*

Laboratoire de l'Innovation Therapeutique (UMR 7200), Faculté de Pharmacie, Université de Strasbourg, 74, route du rhin, 67401 Illkirch, France

The 4-*exo*-dig cyclocarbopalladation has been the central interest of the Suffert group in recent years. New synthetic methods have been developed using this reaction in diverse cascades with palladium coupling reactions, such as Stille, Sonogashira and Suzuki coupling.[1]



A prolongation of the cascade reaction gives access to fast syntheses of complex polycyclic structures. Target compounds are, for example, fenestranes **1**, cyclooctatrienes **2**[2] and taxane scaffolds **3**[3].



The synthesis of a selection of compounds, the optimized conditions and the mechanisms will be discussed in further details.

[1] C. Bour, G. Blond, B. Salem, J. Suffert, *Tetrahedron* **2006**, *62*, 10567.
[2] C. Hulot, S. Amiri, G. Blond, P.R. Schreiner, S. Suffert, *J. Am. Chem. Soc*. **2009**, *131*, 13387.
[3] J. Petrignet, A. Boudhar, G. Blond, J. Suffert, *Angew. Chem. Int. Ed.* **2011**, *50*, 3285.

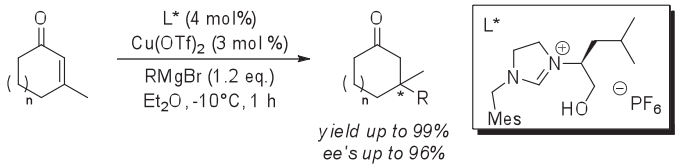
Organic Chemistry **OC 66**

Copper-catalysed asymmetric conjugate additions towards quaternary centers promoted by chiral *N*-heterocyclic carbenes

N. Germain, S. Kehrli, M. Mauduit, A. Alexakis*

University of Geneva, Quai Ernest Ansermet 30, 1211 Geneva 4, Switzerland.

Since asymmetric conjugate additions (A.C.A.) represent a powerful methodology allowing direct access to enantio-enriched enones, we kept our attention on some specific remaining challenges.[1] At this time, only few copper-catalysed nucleophiles were able to be introduced selectively on trisubstitued enones, promoted by various types of NHC's chiral ligands.[2] We consider Grignard reagents as the nucleophilic source of choice because of they are readily available and easily prepared. In order to develop an extended methodology in ACA, *N*-heterocyclic carbenes have shown the best efficiency as a chiral inducer. Using easily-tunable amino-acid-based carbenes, this work focuses on the study of the scaffold and its influence on selectivity.



[1] A. Alexakis, J.E. Bäckvall, N. Krause, O. Pamies, M. Dieguez, *Chem. Rev.* **2008**, *108*, 2796.
[2] a) D. Martin, S. Kehrli, A. Alexakis *J. Am. Chem. Soc.* **2006**, *128*, 8416; b) S. Kehrli, D. Martin, D. Rix, M. Mauduit, A. Alexakis, *Chem. Eur. J.* **2010**, *16*, 9890.

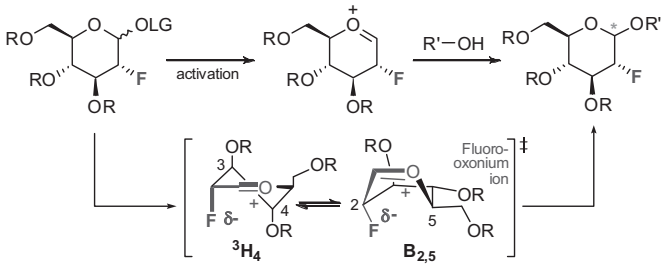
Organic Chemistry **OC 67**

Fluorine-Directed Glycosylation

Christoph Bucher and Ryan Gilmour

ETH Zurich, Wolfgang-Pauli-Strasse 10, 8093 Zurich, Switzerland

A stabilizing fluorine electrostatic interaction has been exploited to control oxonium ion conformation in 2-fluoropyranose derivatives. When matched with the inductive nature of the protecting groups, the glycosyl donors were found to be highly selective (2-F^{Gluc}/benzyl → β; 2-F^{Manno}/pivaloyl → α) leading to fluoro-glycostructures/2-deoxy sugar bioisosteres with excellent control over the anomeric configuration.



[1] C. Bucher and R. Gilmour, *Angew. Chem.* **2010**, *122*, 8906-8910; *Angew. Chem. Int. Ed.* **2010**, *49*, 8724-8728.
[2] C. Bucher and R. Gilmour, *Synlett* **2011**, e-first; DOI: 10.1055/s-0030-1259934.

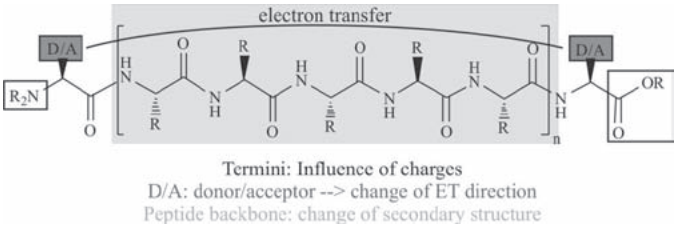
Organic Chemistry **OC 68**

Electron transfer through peptides

Bernd Giese, Katharina M. Fromm, Miriam Lauz

University of Fribourg, Chemin du Musée 9, 1700 Fribourg, Switzerland

Electron transfer (ET) processes are important reactions in biological systems as they play a crucial role for instance in photosynthesis, respiration and other enzymatic reactions.[1] Nevertheless the mechanism of these reactions as well as the parameters which influence these processes are still a matter of ongoing research.



The Giese group has developed a model peptide with which they could show that these ET processes can occur via a hopping mechanism, using specific amino acids as relay stations. Recently they also started investigating the influence of charges on ET rates through peptides.[2]
In our ongoing research the developed model peptides are used to further study parameters, which influence the ET with regard to the rates as well as the direction of the electron transfer, including a deeper insight into the effect charges can play as well as the the role of the secondary structure (figure 1).

[1] J. L. Dempsey, J. R. Winkler, H. B. Gray, *Chem. Rev.* **2010**, *110*, 7024.
[2] J. Gao, P. Müller, M. Wang, S. Eckhardt, M. Lauz, K. M. Fromm, B. Giese, *Angew. Chem. Int. Ed.* **2011**, *50*, 1926.

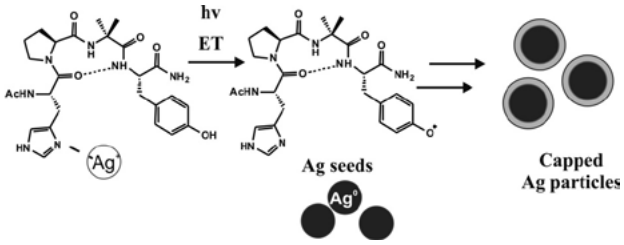
Organic Chemistry **OC 69**

Peptides Interacting with Silver Ions

Katharina M. Fromm, Bernd Giese, Sonja Eckhardt

University of Fribourg, Chemin du musée 9, 1700 Fribourg, Switzerland

Recently it was shown in a split-and-mix peptide library that short peptides are able to form silver nanoparticles (AgNPs) after incubation with silver nitrate and upon irradiation with light or by chemical reduction.[1] The analysis of these peptides showed that certain amino acids play an important role in the peptide mediated formation of AgNPs. Here we present the first results of our mechanistical studies concerning the light induced AgNP formation, in which an electron transfer (ET) has to take place in order to reduce the silver ions. This process is until now not well understood but its understanding would lead to a deeper insight into the antimicrobial action of silver ions on a molecular level.



[1] Belser, K.; Vig-Slenters, T.; Pfumbidzai, C.; Upert, G.; Mirolo, L.; Fromm, K. M.; Wennemers, H. *Angew. Chem. Int. Ed.* **2009**, *48*, 3661.

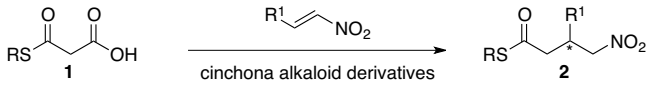
Organic Chemistry **OC 70**

Mono Thiomalonates as Thioester Enolate Equivalents – Organocatalytic Enantioselective 1,4-Addition Reactions to Nitroolefins

Helma Wennemers, Paolo Clerici

Department of Chemistry, University of Basel, St.Johanns-Ring 19
CH-4056 Basel, Switzerland

Thioesters are versatile building blocks in organic synthesis. They allow for a multitude of further transformations.[1] Thus, the introduction of thioesters in more complex molecules is an important goal in organic synthesis. There is still the need for mild methods to generate thioester enolates that are easily applicable. Our group demonstrated that Malonic Acid Half Thioesters (MAHTs) are useful thioester enolate-equivalents for organocatalysed reactions. In the presence of cinchona alkaloids derivatives, MAHTs readily react with nitroolefins to the desired addition product in good yields and stereoselectivities.[2] Herein we report the progresses achieved by optimising the substrate structure and the reaction conditions.



Small changes in the structure of MAHTs lead to γ-nitro thioesters (**2**) with improvements in reactivity and selectivity for 1,4 addition to nitroolefins. Electron poor and rich aromatic, as well as aliphatic nitroolefins were used and all the addition products were obtained in excellent yields and selectivities (*ee* 89- ≥99%).

[1] Miyazaki, Y. Han-ya, H. Tokuyama, T. Fukuyama, *Synlett* **2004**, 477.
[2] J. Lubkoll, H. Wennemers, *Angew. Chem. Int. Ed.* **2007**, *46*, 6841.

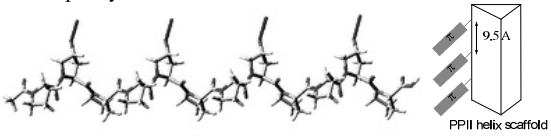
Organic Chemistry **OC 71**

Self-organizing Organic Semiconductor-Oligoproline Hybrids

Francelin Bouillère,[a] Gregory Upert,[a] Sylvia Schmid [b], Peter Bäuerle [b], Chen Li [c], Klaus Müllen [c], Helma Wennemers [a]

[a]*Department of Chemistry, University of Basel, St. Johanns Ring 19, 4056 Basel Switzerland.* [b]*Institute of Organic Chemistry II and Advanced Materials, Ulm University, Albert-Einstein-Allee 11, 89081 Ulm, Germany.* [c]*Max-Planck-Institute for Polymer Research, Ackermannstrasse 10, 55125 Mainz, Germany.*

In recent years, it became clear that the performance of organic nanoelectronic devices is improved by programmed molecular self-assembly of molecules into ordered supramolecular structures. In this context, peptides with defined secondary structures are particularly interesting for the enhancement of self-organisation of oligomeric semiconducting materials[1]. The modular nature of the peptidic oligoproline-based scaffold seems ideally suited for accessing hybrid materials with organic semiconductors. The Wennemers group has recently established azidoproline containing oligoprolines as conformationally well-defined helical scaffolds[2]. These functionalizable oligoprolines are particularly attractive molecular scaffolds since they adopt a well-defined polyproline II (PPII) structure, in which every third residue is stacked on top of each other. Here we will show the synthesis of PPII helical peptides covalently and non-covalently functionalized with π-conjugated thiophene-and phenylene-based moieties.



[1] K. S. Akerfeldt et al, *Org. Lett.* **2005**, *7*, 2559.
[2] H. Wennemers et al, *J. Am. Chem. Soc.* **2007**, *129*, 466.

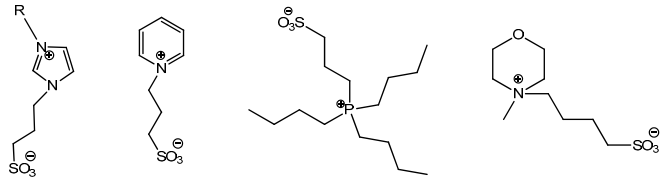
Organic Chemistry **OC 72**

Synthesis of Novel Zwitterionic Liquids

Roger Marti*, Ennio Vanoli, Sandrine Aeby

Institute of Chemistry, University of Applied Sciences Western Switzerland, Bd Perolles 80, CH-1700 Fribourg, Switzerland

Ionic liquids (IL) are an important class of novel alternative solvents. They have unique properties like no measurable vapor pressure or they can solubilize biopolymers. They also can be used as catalysts in various reactions.
We prepared a series of novel zwitterionic ILs by reacting amines or phosphin's with propane- or butanesultone; the products were obtained in good yields. All these compounds have been thoroughly characterized by their melting point, polarity, viscosity, and hydrophobicity. We developed a new method for the determination of the polarity of these zILs based on Reichard's and Nile Red's method.



For the phosphonium-based zILs we observed different polymorphisms which have been characterized by IR, X-Ray diffraction, and DSC.
We also report the optimization of the synthesis, including RC-1 studies on the thermal safety and performed a scale-up for selected zILs.
The scope of these new zwitterionic IL applications is very large and we are currently exploring them as alternative solvents or catalysts.

[1] Christian Reichardt, *Green. Chem.*, **2005**, 7, 339-351
[2] H.O-Bourbigou, L.Magna, D.Morvan, *Applied catalysis A: General 353,* **2010**, 1-56

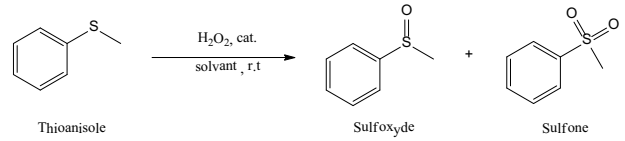
Organic Chemistry **OC 73**

Sulfide Oxidation Reaction - Catalyst Screening & Flow Chemistry

Roger Marti, Romain Despland

Institute of Chemistry, University of Applied Sciences Western Switzerland, Bd de Pérolles 80, 1705 Fribourg, Switzerland

Organic sulfoxides are useful synthetic intermediates and play an important role as therapeutic agents. The increasing interest and applications of sulfoxides have stimulated investigations on new methodologies of sulfoxide synthesis. The simplest procedure for the synthesis of sulfoxydes involves the oxidation of sulfide with hydrogen peroxide in the presence of various catalysts [1].



After screening of different catalysts, Silica sulfuric acid (SSA) [2] was selected due to its reactivity, selectivity, and it is consistent with the goals of "Green Chemistry". The reaction was optimized regarding solvent, temperature and H_2O_2 / catalyst equivalents. The optimum conditions are: 0.2 eq. of SSA, 2 eq. of hydrogen peroxide, methanol as solvent at 60°C.
Based on DSC and RC1 measurements a kinetic modeling was performed and the rate law was determined using the RPKA method [3]. Finally we were able to transfer the batch reaction into a continuous reaction with similar selectivity's and yields.

[1] Ahmad Shaabani, Ali Hossein Rezayan, *Catal. Commun.* **2007**, 8.
[2] Katarzyna Kaczorowska, Zofia Kolarska, Katarzyna Mitka, Piotr Kowalski, *Tetrahedron* **2005**, 61, 8315-8327.
[3] Donna G. Blackmond, *Angew. Chem. Int. Ed.* **2005,** 44, 4302-4320.

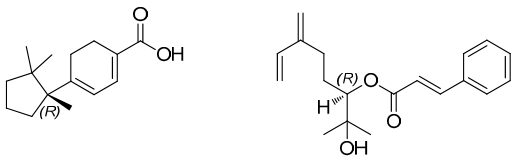
Organic Chemistry **OC 74**

Assignment of the Absolute Configuration of New Natural Products from *Kadsura longipedunculata* by Density Functional Theory Calculation of ECD Spectra

Janine Zaugg[1], Samad Nejad Ebrahimi[1], Martin Smiesko[2], Matthias Hamburger[1]

[1]Pharmaceutical Biology and [2]Molecular Modeling, Department of Pharmaceutical Sciences, University of Basel, Switzerland

NMR and X-ray crystallography are essential analytical methods for structure elucidation of natural products. However, the assignment of the absolute configuration remains challenging and is often neglected even though bioactivity and stereostructure are very often closely linked [1]. For UV-absorbing chiral compounds quantum chemical electronic circular dichroism (ECD) calculations are increasingly used in the assignment of absolute configuration in comparison with experimental ECD spectra [2]. In the framework of natural products based hit and lead discovery, we investigated a petroleum ether extract of *K. longipedunculata* fruits. Among the isolated compounds, two were identified as new natural products. Their structure and absolute configuration was established by ESITOF-MS, 1D and 2D NMR experiments, and by comparison of experimental ECD spectra with simulated ECD spectra using density function theory (DFT) in gas phase (B3LYP/6-31G**) and methanol (B3LYP-SCRF/6-31G**).



[1] Waldeck, B., *Pharmacol. Toxicol*. **2003**, *93*, 203.
[2] Bringmann, G. et al., *Eur. J. Org. Chem.* **2009**, 2717.

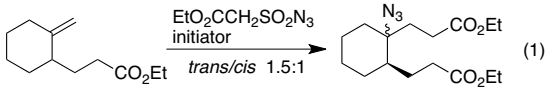
Organic Chemistry **OC 75**

Highly Stereoselective Radical Mediated Desulfonylative Group Transfer Reactions

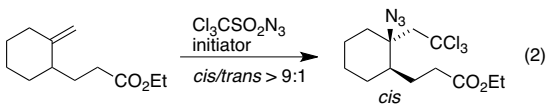
Cédric Bürki, Lidong Cao, Karin Weidner, Philippe Renaud*

Universität Bern, Departement für Chemie und Biochemie, Freiestrasse 3, CH-3012 Bern, Switzerland

Desulfonylative azido group transfer reactions have been recently reported [1]. In a single step, a new C–C and a C–N bond are created at vicinal positions. However, when an ester substituted radical is involved, the caboazidation of 2-substituted methylenecyclohexane affords the *trans* diastereoisomer with low stereocontrol (eq. 1) [2].



We report here that the use of a trichloromethyl radical leads to a reversal of the stereochemical outcome together with an excellent level of stereocontrol (eq. 2). The reaction has been extended to stereoselective desulfonylative chlorine atom and sulfanyl group transfer reactions.



[1] K. Weidner, A. Giroult, P. Panchaud, P. Renaud, *J. Am. Chem. Soc.* **2010**, *132*, 17511.
[2] S. Cren, P. Schär, P. Renaud, K. Schenk, *J. Org. Chem.* **2009**, *74*, 2942.

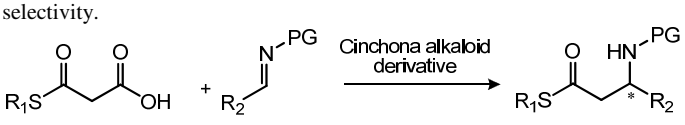
Organic Chemistry **OC 76**

Cinchona Alkaloid Catalyzed Mannich Reaction of Mono Thiomalonates with Imines

Annette Bahlinger and Helma Wennemers*

Department of Chemistry, University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

Thioesters are common chemical building blocks for a variety of biological and pharmaceutical important compounds.[1] For the introduction of thioesters through catalytic asymmetric reactions, thioester enolates are useful reagents. Recently our [2] as well as the Ricci group [3] introduced Malonic Acid Half Thioester (MAHTs) as thioester enolate-equivalents. These substrates readily undergo addition reactions to nitroolefins and imines in the presence of cinchona alkaloid derivatives in good yields and selectivities. [2,3] However the low reactivity of MAHTs requires high catalyst loading and long reaction times. Herein we report the addition reaction of an optimized MAHT substrate to imines with great improvements in reactivity and selectivity.



Only 1 mol% of a cinchona alkaloid derivative is necessary to catalyze the Mannich-type reaction with a variety of substrates in excellent yields (up to 99%) and selectivities (up to 96% ee). With the resulting β-amino thioesters optically active β-amino acids and β-lactams can easily be prepared.

[1] T. Miyazaki, Y. Han-ja, H. Tokuyama, T. Fukuyama, *Synlett* **2004**, 477.
[2] J. Lubkoll, H. Wennemers, *Angew. Chem. Int. Ed.* **2007**, *46*, 6841.
[3] A. Ricci, D. Pettersen, L. Bernardi, F. Fini, M. Fochi, R. P. Herrera, V. Sgarzani, *Adv. Synth. Catal.* **2007**, *349*, 1037.

Organic Chemistry **OC 77**

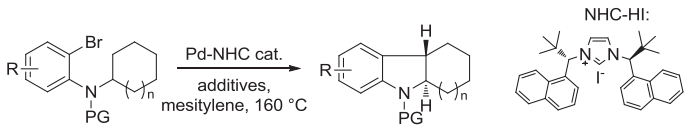
Pd-Catalyzed Asymmetric Synthesis of Indolines via C-H Activation

Masafumi Nakanishi, Dmitry Katayev, Céline Besnard, E. Peter Kündig

University of Geneva, Department of Chemistry, 30 Quai Ernest Ansermet, 1211 Geneva 4, Switzerland

Metal-catalyzed C-H activation is a powerful emerging tool in modern organic synthesis. In this field, the functionalization of unactivated C(sp^3)-H bonds still remains a challenge. The indoline motif is found in a large number of natural products and pharmaceuticals. Recently, the synthesis of indolines has been reported via palladium-catalyzed activation of alkyl groups.[1] In this area, asymmetric approaches would be a particularly powerful tool, although there have not been reports on this so far.

N-heterocyclic carbenes (NHCs) have shown to be outstanding ligands in transition metal catalyzed transformations. Recently, we showed that new bulky chiral NHC ligands derived from chiral *o*-substituted *α*-alkyl-phenethyl amines perform efficiently in the intramolecular arylation of amides to give highly enantioenriched 3,3-disubstituted oxindoles.[2] In this communication we report on a successful approach to the highly enantioselective synthesis of fused indolines using members of the same chiral NHC-ligand family.



up to 95% yield and 95% e.e.

[1] (a) Watanabe, T.; Oishi, S.; Fujii, N.; Ohno, H. *Org. Lett.* **2008**, *10*, 1759-1762; (b) Neumann, J. J.; Rakshit, S.; Dröge, T.; Glorius, F. *Angew. Chem. Int. Ed.* **2009**, *48*, 6892-6895.

[2] (a) Jia, Y.-X.; Katayev, D.; Bernardinelli, G.; Seidel, T. M.; Kündig, E. P. *Chem. Eur. J.* **2010**, *16*, 6300-6309. (b) Kündig, E. P.; Seidel, T. M.; Jia, Y.-X.; Bernardinelli, G. *Angew. Chem. Int. Ed.* **2007**, *46*, 8484-8487.

Organic Chemistry **OC 78**

Synthesis of Multivalent Glycopeptide Dendrimers as High-Affinity Inhibitors against *Pseudomonas aeruginosa* Lectin LecA

Myriam Bergmann, Tamis Darbre, Jean-Louis Reymond

Department of Chemistry and Biochemistry, University of Berne, Freiestrasse 3, CH-3012 Berne, Switzerland

The gram-negative bacterium *Pseudomonas aeruginosa* is an opportunistic human pathogen causing lethal airways infections. It can form surface-attached biofilms on tissues of infected patients protecting itself from classical antibiotic therapy. Tissue adhesion and biofilm formation is mediated in part by the fucose-specific lectin LecB and the galactose-specific lectin LecA. We are investigating glycopeptide dendrimers as multivalent ligands for PA LecA. Dendrimers, displaying a regularly branched tree-like structure, offer an optimal synthetic platform to explore multivalency effects. For a better understanding of effect of multivalency, we synthesized 2nd, 3rd and 4th generation glycodendrimers displaying 4, 8 and 16 sugars by thioether ligation. In this thioether ligation, glycodendrimers with a C-terminal cysteine residue couple in multiple copies by substitution of the chlorine atom at the multiple chloroacetylated N-termini of another peptide dendrimer. The activity of glycodendrimers on LecA was tested by hemagglutination inhibition assay and competition ELLA test. Enhanced affinity to LecA was observed with higher generation dendrimers (multivalency effect).

[1] C. Chemani, A. Imberty, S. de Bentzmann, M. Pierre, M. Wimmerová, B. P. Guery, K. Faure, *Infect Immun.* **2009**, *77*, 2065.

[2] E. M. V. Johansson, S. A. Crusz, E. Kolomiets, L. Buts, R. U. Kadam, M. Cacciarini, K.-M. Bartels, S. P. Diggle, M. Cámara, P. Williams, R. Loris, C. Nativi, F. Rosenau, K.-E. Jaeger, T. Darbre, J.-L. Reymond, *Chem Biol.* **2008**, *15*, 1249

Organic Chemistry **OC 79**

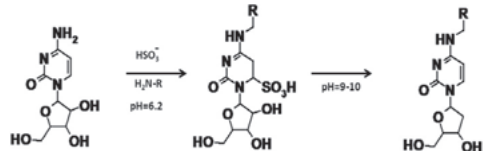
Site-specific transamination of cytidine

Igor A. Oleinich, Eva Freisinger

Institute of Inorganic Chemistry, University of Zurich Winterthurerstr. 190, 8057 Zurich, Switzerland

Non-natural modifications of oligonucleotides have unusual properties and can be used for a range of therapeutic and analytical purposes, including the treatment of diseases, the regulation of gene expression, as well as investigation of DNA and RNA tertiary structures [1]. Restriction of the lengths of such modified oligonucleotides accessible by solid-phase synthesis made us follow an alternative approach.

Our objective in the present study was to perform the site-specific modification of cytidine without disrupting the Watson-Crick base pairs. This can be done via transamination of cytidine at the N4 position [2]. For this, a diaminoethane derivative with a free amino group was coupled to a complementary DNA strand. After duplex formation, activation of the target cytidine moiety was achieved with hydrogensulfite followed by the transamination reaction.



[1] J. F. Milligan, D. R. Groebe, G. W. Witherell, O. C. Uhlenbeck, *Nucleic Acids Res.* **1987**, *15*, 8783.

[2] J. Molander, P. Hurskainen, *Bioconjugate Chem.* **1993**, *4*, 362.

Financial support from the Swiss National Science Foundation is gratefully acknowledged (*SNSF-Professorship* PP002-119106/1 to EF).

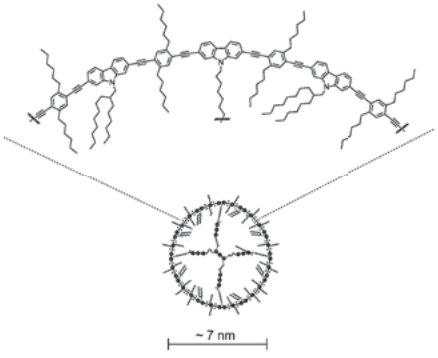
Organic Chemistry **OC 80**

Synthetic Strategies Towards Carbazole Based Macrocycles

Thomas R. Eaton, Marcel Mayor

University of Basel, Department of Chemistry, St. Johannsring 19, CH-4056 Basel, Switzerland

Metameterials have unusual physical properties characterised by possessing a negative magnetic permeability (μ) and electronegativity (ε). Obtaining this effect at visible wavelengths requires a bottom-up approach.[1] A template directed synthesis of a fully conjugated, 7 nm diameter macrocycle was undertaken.



Precise control over building block morphology is combined with functional group control using a range of polar, orthogonal acetylene protecting groups to assemble a macrocyclic structure via palladium catalysed cross-coupling reactions.[2] The carbazole enhances the photo-physical properties of the cycle and allows studies of aggregation behaviour in solution.

[1] M. Mayor, C. Didschies, *Angew. Chem. Int. Ed.*, **2003**, *42*, 3176–3179

[2] N. J. Jenny, M. Mayor, T. R. Eaton, *Eur. J. Org. Chem.* **2011**, in press

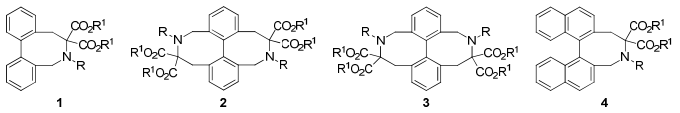
Organic Chemistry **OC 81**

Metal-catalyzed synthesis of chiral biaryl azocines

Steven Harthong, Jérôme Lacour

Department of Organic Chemistry, University of Geneva
30, quai Ernest Ansermet, 1211 Geneva 4, Switzerland

Biaryl azepines and derivatives have been strongly studied as chiral reagents, ligands or catalysts.[1] In many asymmetric applications, it was shown that the dihedral angle around the central bond joining the aromatic rings controls the level of stereoinduction.[2] Often, the larger the dihedral angle, the better the selectivity. Herein, we report studies aimed at enlarging the seven-membered ring of twisted biaryl azepines to novel 8-membered axially chiral azocines in one single step.



Simple treatment of azepine precursors with diazodicarbonyls under Cu(I) or Rh(II) catalysis[3] afford desired derivatives of type **1** to **4** in moderate to good yield (30-90%). Stereodynamic studies on compounds **1** (VT-NMR, 25-120 °C) and **2** (solution in decane, 1 week, 160 °C) indicate an increase of the rotational barrier by at least 6 and 15 kcal/mol respectively. Such difference can only be accounted larger dihedral angles around the biaryl bonds.

[1] C. Rosini, L. Franzini, A. Raffaelli and P. Salvadori, *Synthesis*, 1992,503 ; M. McCarthy and P. J. Guiry, *Tetrahedron*, 2001, **57**, 3809 ; G.Bringmann, A. J. P. Mortimer, P. A. Keller, M. J. Gresser, J. Garner and M. Breuning, *Angew. Chem., Int. Ed.*, 2005, **44**, 5384.
[2] Novikov, R. *et al. Adv. Synth. Catal., **2008**, 350*, 111
[3] J. A. Vanecko, H. Wan and F. G. West *Tetraehdron*, **2006**, *62*, 1043

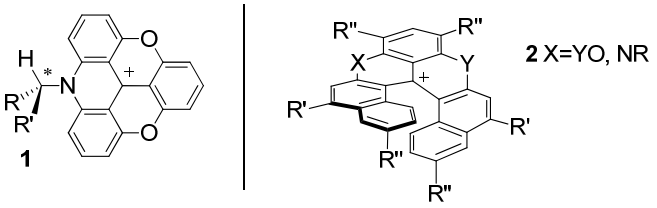
Organic Chemistry **OC 82**

Modular synthesis of chiral cationic dyes

Jérôme Gouin, Franck Torricelli and Jérôme Lacour*

University of Geneva, Quai Ernest Ansermet 30, 1211
Geneva 4, Switzerland

Triangulenium ions and precursor derivatives[1] have been strongly studied for biological[2], chemical, photophysical[3], stereochemical, structural, supramolecular, and synthetic properties. Herein, two classes of new analogues are reported. First, the synthesis and properties of highly fluorescent azadioxatriangulenium (ADOTA) cations of type **1** are detailed; these compounds being readily prepared as single enantiomers from enantiopure amines. Then, short and concise routes to polysubstituted cationic [6]helicenes of type **2** to **4** will be shown. These routes allow the facile regioselective and orthogonal functionalization of the helical core. Electronic modulation of the optical and chiroptical properties of these derivatives is then achieved and will be presented.



[1] Laursen, B. W.; Krebs, F. C. *Chem. Eur. J* **2001**, 7, 1773
[2] Y. K. Kim, *J. Am. Chem. Soc.* **2010**, *132*, 576; S. S. Fernandes, *Microbes and Infection* **2010**, *12*, 287; Reynisson, J.; Chaires, J. B. *J. Am. Chem. Soc*. **2003**, 125, 2072
[3] Nicolas, C; Lacour, J. *J. Phys. Org. Chem.* **2010**, 23 1049

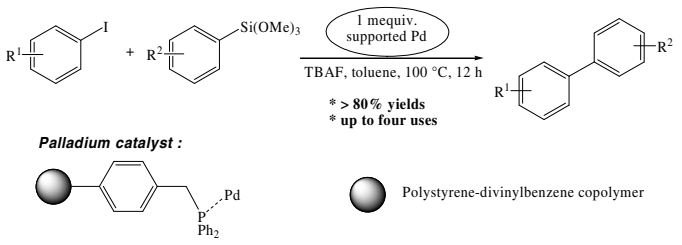
Organic Chemistry **OC 83**

An Efficient and Reusable Polystyrene-supported Palladium Catalyst for Hiyama Couplings

Carine Diebold, Jean-Michel Becht and Claude Le Drian

Institut de Science des Matériaux de Mulhouse (IS2M) – LRC CNRS 7228
15 rue Jean Starcky, F-68057 Mulhouse cedex

The Hiyama reaction of aryl iodides with trialkoxyarylsilanes is a palladium-catalyzed reaction of growing importance in modern organic synthesis which offers an interesting alternative to the widely used Suzuki-Miyaura coupling. This reaction is generally performed in the presence of an expensive soluble palladium catalyst which is usually impossible to recover and causes frequently the presence of traces of precious metal in the reaction products. To date, only few efficient reusable palladium catalysts for Hiyama couplings have been reported.
We describe here an active diphenylphosphinomethylpolystyrene-supported palladium catalyst for Hiyama reactions from aryl iodides. This catalyst can be recovered by simple filtration and reused up to three times with no loss of efficiency.[1]



[1] S. Schweizer, J.-M. Becht, C. Le Drian, *Adv. Synth. Catal.* **2007**, *349*, 1150; S. Schweizer, J.-M. Becht, C. Le Drian, *Tetrahedron* **2010**, *66*, 765.

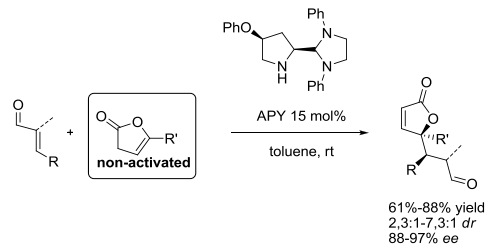
Organic Chemistry **OC 84**

Highly Enantioselective Direct Vinylogous Michael Addition of γ-Butenolide to Enals

Alice Lefranc, Adrien Quintard, Alexandre Alexakis*.

University of Geneva, Quai Ernest Ansermet 30, 1211 Geneva 4,
Switzerland.

In recent years, aminocatalysis and particularly iminium catalysis has become an essential activation mode for the asymmetric β-functionalization of conjugated carbonyl compounds. Our group recently developed Aminal-PYrrolidine (APY) catalysts as powerful tools for aminocatalyzed reactions.[1] In this context, we disclosed the development of an unprecedented and simple direct vinylogous addition of deconjugated butenolide to enals in excellent stereoselectivities (>95% *ee*).[2] This methodology allows for the efficient preparation of complex γ-butenolide from Angelica lactone derivatives, directly obtained from readily available renewable resources. Furthermore, preliminary mechanistic investigations allowed for a better understanding of the process.



[1] a) A. Quintard, C. Bournaud, A. Alexakis, *Chem. Eur. J.*, **2008**, *14*, 7504-7507 ; b) A. Quintard, S. Belot, E. Marchal A. Alexakis, *Eur. J. Org. Chem.*, **2010**, 927-936.
[2] A. Quintard, A. Lefranc, A. Alexakis, *Org. Lett.*, **2011**, *13*, 1540-1543.

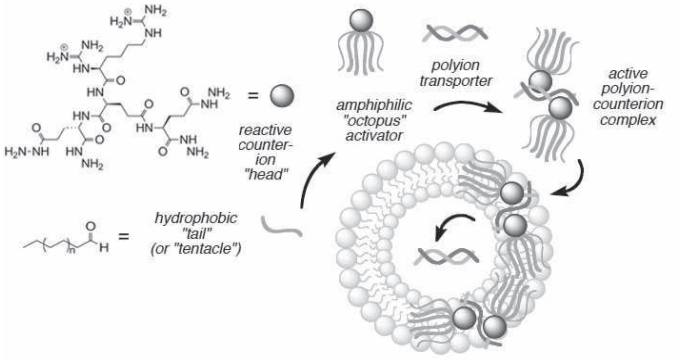
Organic Chemistry **OC 85**

Octopus Amphiphiles as Nucleic Acid Activators

Eun-Kyoung Bang, Javier Montenegro, Charlotte Gehin, Howard Riezman, and Stefan Matile

Departments of Organic Chemistry and Biochemistry, NCCR Chemical Biology, University of Geneva, Geneva, Switzerland

The activity of dynamic polyion-counterion complexes in lipid bilayer membranes is of scientific interest with regard to topics as diverse as transmembrane transport, voltage gating, sensing, and cellular uptake. Recently, polyion-counterion complexes have been used to create the first differential sensing system that works, like biological olfactory systems, in lipid bilayer membranes [1]. In this report, hydrophobic analytes are reacted in situ with cationic hydrazides to yield amphiphilic cations [2]. These cationic amphiphiles then can function as activators of polyanionic cation transporters such as nucleic acids in lipid bilayer membranes.



[1] T. Takeuchi, J. Montenegro, A. Hennig, S. Matile, *Chem. Sci.* **2011**, *2*, 303.
[2] J. Montenegro, A. Fin, S. Matile, *Org. Biomol. Chem.* **2011**, *9*, 2641.

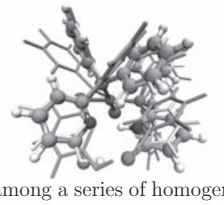
Organic Chemistry **OC 86**

Fast Computational Methods for Transition Metal Complexes

Jing Huang, Markus Meuwly*

University of Basel, Klingelbergstrasse 80, CH-4056 Basel, Switzerland

Rapid calculation of the structures and energies of transition metal complexes is desirable for understanding and optimizing catalysts. Here we present the computational characterization of a hydrogen-bonded bidentate catalyst from a molecular mechanics (MM) based strategy for this purpose.



$[Cl_2Pt(6\text{-}DPPon)_2]$ is among a series of homogeneous catalysts proposed, characterized and tested by Breit et al.[1], which constitute the self-assembly of monodentate ligands through hydrogen bonding and provide high activity and regioselectivity in hydroformylation. Here we show that MM force fields (VALBOND+MMPT) [2, 3] are suitable for a detailed characterization of structures and energetics of such complexes. Molecular dynamics simulations of this Platinum complex were carried out. Infrared, UV-Vis and NMR spectra were computed, and the hydrogen bonding situation was studied. Combining force field methods with *ab initio* calculations and experimental data, modes of action of $[Cl_2Pt(6\text{-}DPPon)_2]$ can be characterized in atomistic detail. [4, 5]

[1] B. Breit, W. Seiche, *JACS*, **2003**, *125*, 6608.
[2] I. Tubert-Brohman, M. Schmid, M. Meuwly, *JCTC*, **2009**, *5*, 530.
[3] S. Lammers, S. Lutz, M. Meuwly, *JCC*, **2008**, *29*, 1048.
[4] U. Gellrich, J. Huang, W. Seiche, M. Keller, M. Meuwly, B. Breit, *JACS*, **2011**, *133*, 964.
[5] J. Huang, U. Gellrich, B. Breit, M. Meuwly, *in preperation*

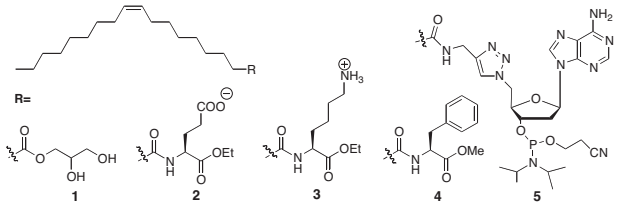
Organic Chemistry **OC 87**

Design and Synthesis of Novel Lipids for the Fabrication of Functional Lipidic Cubic Phase Biomaterials.

Yazmin M. Osornio, Peter Uebelhart, Silvan Bosshard, Fabian Konrad, Jay S. Siegel, Ehud M. Landau*

Institute of Organic Chemistry, University of Zurich, Winterthurestr. 190, CH-8057 Zürich, Switzerland

Hydrated lipids can self-assemble into a variety of thermodynamically and structurally well-defined, distinct materials, which, on the basis of the respective lipid-water phase diagram, are also termed phases.[1] Of special interest to our investigations are the bicontinuous lipidic cubic phases (LCPs), which owning to their symmetry and internal structure have found use in diverse areas from cell biology to material science.[2] We have synthesized a series of novel lipids with designed functionalities. These lipids are based on conjugation of α-amino acids **2-4** and nucleotide **5** to the oleoyl lipid chain. When mixed with monooleoyl-rac-glycerol **1** (MO) and water at appropriate proportions, they self assemble to form bicontinuous lipid cubic phases that exhibit the well-known material properties of LCPs such as phase stability, optical transparency and chemical permeability.



[1] Luzzati, V.; Husson, F. *J. Cell. Biol* **1962**, *12*, 207-219.
[2] Lynch, M. L.; Spicer, P. T., *Bicontinuous Liquid Crystals Surfactant Science Series*, vol 127; Eds.; CRC Press: Boca Raton, 2005.

Organic Chemistry **OC 88**

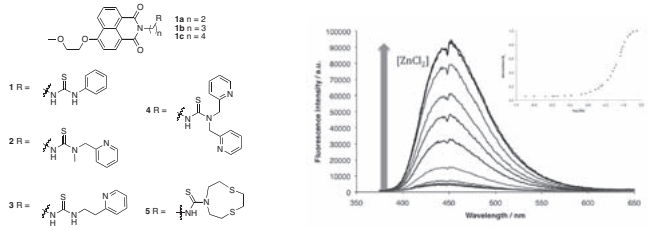
New Signaling Mechanism for Fluorescent Chemosensors Based on Photoinduced Electron Transfer from Thiourea

Mireille Vonlanthen, Nathaniel Finney*

Institute of Organic Chemistry, University of Zürich, Winterthurerstr. 190, CH-8057 Zürich, Switzerland

The goal of our project is the development of a new signaling process for fluorescent chemosensors. Until now benzylic nitrogen atoms are most commonly used for photoinduced electron transfer (PET) quenching as a mechanism for fluorescence chemosensor [1]. In our work thiourea will be used as a quencher moiety for a naphthlimide fluorophore. Compounds **1a**, **1b** and **1c** were synthesized and distance dependence of the quenching was observed. Electrochemical analyses were performed to confirm that an electron transfer from the thiourea to a naphthalimide fluorophore occurs.

An enhancement of the fluorescence upon addition of zinc ions has been observed for **1a**. Following this observation, a series of naphthalimides fluorophores with different substituent on the thiourea **2-5** were synthesized. The modification of the structure leads to changes of the fluorescence response upon addition of various metal ions.



[1] For representative review, see: Callan, J. F. de Silva, A. P. Magri, D. C. *Tetrahedron*, **2005**, *61*, 8551.

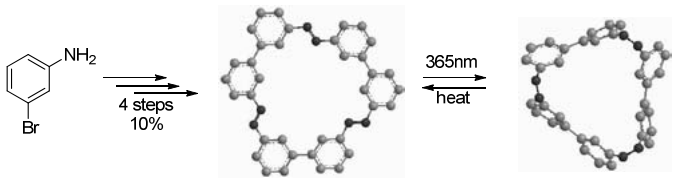
Organic Chemistry **OC 89**

Oligoazobenzenes – Synthesis, Photochemistry and Application

Raphael Reuter, Hermann A. Wegner

Department of Chemistry, University of Basel, St. Johanns-Ring 19, Basel, Switzerland

Controlling the spatial arrangement of chemical structures on a molecular level in a reversible manner is still one of the ‚holy grails' in chemistry. A tool to achieve this task would enable the switching of a certain function enabled by a specific conformation. The azobenzene moiety has been shown to fulfill this requirement as it changes geometry from the more stable *E*-isiomer to the *Z*-isomer upon irradiation. The arrangement of azobenzene units in a macrocyclic fashion adds a new dimensionality to this powerful tool. In the past years we developed an efficient entry to triscycloazobenzenes as well as triscycloazobiphenyls.[1] Choosing the right conditions each isomer of the multiphotochromic compounds can be accessed.[2] Based on this knowledge these molecules are evaluated for applications such as liquid crystals, molecular grippers or optical storage devices.[3]



[1] Reuter, R.; Hostettler, N.; Neuenburg, M.; Wegner, H. A. *Eur. J. Org. Chem.* **2009**, 5647–5652.

[2] Reuter, R.; Wegner, H. A. *Chem. Eur. J.* **2011**, *17*, 2987–2995.

[3] Reuter, R.; Wegner, H. A. *in preparation*.

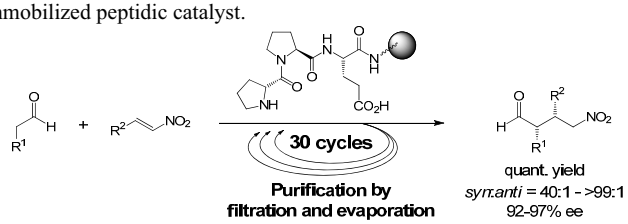
Organic Chemistry **OC 90**

Efficient Recovery and Reuse of an Immobilized Peptidic Organocatalyst

Yukihiro Arakawa and Helma Wennemers

Department of Chemistry, University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

Readily reusable immobilized organocatalysts are important from a practical, economic, and environmental viewpoint. However, their successful development has proven challenging and only limited reaction and recovery cycles have been achieved.[1] We report an extraordinarily robust resin bound tripeptidic organocatalyst that can be readily reused for at least 30 reaction and recovery cycles without loss in catalytic activity or stereoselectivity.[2] The immobilized catalyst can be directly reused for conjugate addition reactions between aldehydes and nitroolefins after a simple filtration from the reaction products. A broad range of γ-nitroaldehydes were isolated easily after filtration and removal of all volatiles in quantitative yields, excellent dia- and enantioselectivities and, most remarkably, perfect analytical purities. The ease of handling allows for a facile scale-up of reactions catalyzed by the immobilized peptidic catalyst.



[1] For a recent review, see: T. E. Kristensen, T. Hansen, *Eur. J. Org. Chem*. **2010**, 3179.

[2] Y. Arakawa, M. Wiesner, H. Wennemers, *Adv. Synth. Catal*. **2011**, accepted.

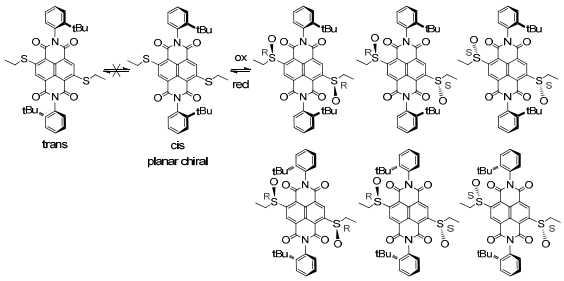
Organic Chemistry **OC 91**

Chiral π-Acidic Naphthalenediimides

Nai-Ti Lin, Andreas Vargas Jentzsch, Stefan Matile*

Department of Organic Chemistry, University of Geneva, 30 Quai Ernest Ansermet, 1211 Geneva 4, Switzerland

Chiral naphthalenediimides (NDIs) with very high positive quadrupole moment (Q_{ZZ} > +19 B) were prepared by using sulfur redox chemistry.[1] Each stereoisomer was isolated and characterized by ^{1}H NMR, HPLC and single-crystal x-ray diffraction. π-Acidic NDIs are known to complex chloride anion in gas phase and selectively transport anions in lipid bilayer membranes via anion-π interaction.[2] Applications of the chiral π-acidic NDIs in anion-π catalysis, self-sorting, anion transport and optoelectronics are in progress in our laboratory.



[1] J. Míšek, A. J. Vargas, S. Sakurai, D. Emery, J. Mareda, S. Matile, *Angew. Chem. Int. Ed.* **2010**, *49*, 7680-7683.

[2] R. E. Dawson, A. Hennig, D. P. Weimann, D. Emery, V. Ravikumar, J. Montenegro, T. Takeuchi, S. Gabutti, M. Mayor, J. Mareda, C. A. Schalley, S. Matile, *Nature Chem.* **2010**, *2*, 533-538.

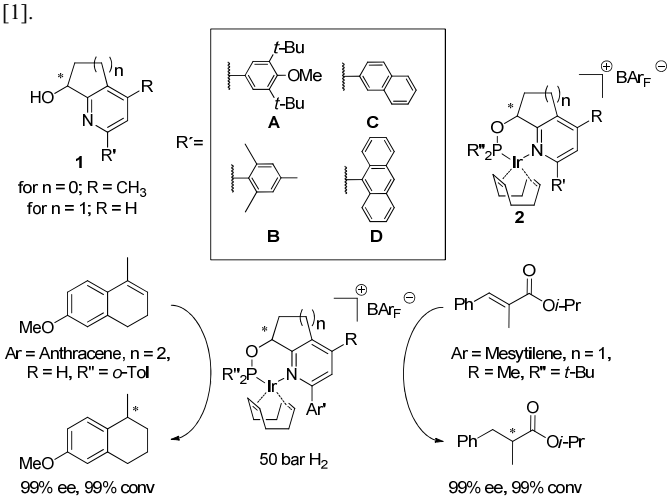
Organic Chemistry **OC 92**

Chiral Pyridyl Phosphinites With Large Aryl Substituents As Efficient Ligands For The Asymmetric Iridium-Catalyzed Hydrogenation

Marc-André Müller, David Woodmansee, Andreas Pfaltz*

University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

Using a flexible synthesis, new chiral iridium N,P complexes with sterically demanding aryl substituents were synthesized and used in the asymmetric hydrogenation of challenging substrates. Herein we present our flexible, optimized synthesis for this modular catalyst system and give a small overview about the performance of this systems in asymmetric hydrogenation [1].



[1] D. H. Woodmansee, M. A. Mueller, M. Neuburger, A. Pfaltz, *Chem. Sci.* **2010**, *1*, 72.

Organic Chemistry **OC 93**

Approach towards an Applied voltage triggered spin switch

Gero D. Harzmann, Marcel Mayor

University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

During the last two decades numerous set-ups enabling the integration of single molecules into electronic circuits have been developed and the correlation between molecular structures and their transport features provided the required comprehension to integrate electronic functions by molecular design.[1] The concept of an applied voltage triggered spin switch has been developed based on Fe-terpyridine complexes exhibiting different spin properties depending on their coordination environment. It should be possible to trigger a geometrical change due to the push-pull system within the target structure (fig. 1) by applying electric fields of varying strengths to the complex immobilized between two gold electrodes which should then be accompanied by an alteration of the central Fe-ions spin state.

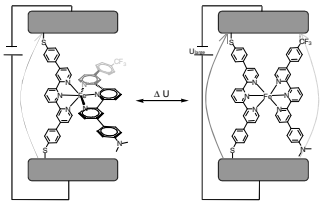


Fig. 1: Fe- terpyridine complex as a potential voltage-triggered spin switch

The assembly of the two different terpyridine units has been achieved by a series of Suzuki reactions which give unprecedented easy access to the desired special 4,4''- substitution pattern and should be of high potential use for related synthetic problems involving the assembly of heterocyclic fragments bearing substitution patterns similarly difficult to access.

[1] N. Weibel, S. Grunder, M. Mayor, *Org. Biomol. Chem.,* **2007**, *5*, 2343

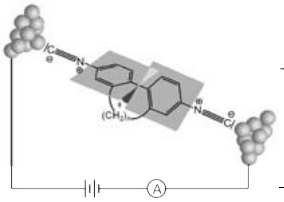
Organic Chemistry **OC 94**

Terminally diisocyano functionalized and rotationally restricted biphenyl systems

Markus Gantenbein, David Vonlanthen, Jürgen Rotzler, Jan Brunner, Marcel Mayor

University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

The feature of conductance of the molecular junction is contributed to two different physical characteristics, namely the energy matching between the Fermi level of metal electrodes and the influence of the interaction between the conduction orbital of the molecule (HOMO or LUMO) and the bonding end groups on the overall electronic conduction through a molecule. Consequently, different systems exhibiting molecular conductance were investigated by changing the anchor groups [1,2]. This project presents a universal synthetic strategy towards terminally isocyano functionalized biphenyl systems.



	Molecule	Conductance (G_0)
1	CN–⟨⟩–NC	$2.1 \cdot 10^{-3}$
2	NC–⟨⟩–CN	$3.6 \cdot 10^{-5}$
3	RS–⟨⟩–SR	$1.7 \cdot 10^{-4}$

The strong metal–CN bond and the smaller energy gap are very promising for an increased electron transport through the junction.

[1] Vonlanthen D., Mishchenko A., Elbing M., Neuburger M., Wandlowski T., Mayor M., *Angewandte Chemie-International Edition* **2009**, *48*, 8886.

[2] Rotzler J., Vonlanthen D., Barsella A., Boeglin A., Fort A., Mayor, M., *European Journal of Organic Chemistry* **2010**, 1096

Organic Chemistry **OC 95**

Conditional Triggered Drug Release

Tatiana Cotting, Elia Janett, Christian G. Bochet*

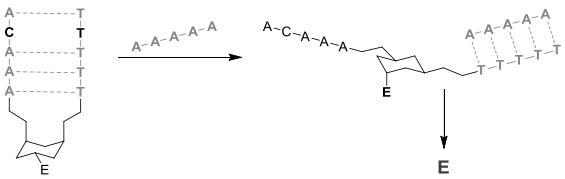
Department of Chemistry, University of Fribourg, Ch. du Musée 9, CH-1700 Fribourg, Switzerland

The percentage of infection in the internal fixation devices or joint replacements is very high and the treatment of infected implants is difficult and involves physical and psychological suffering of the patients. Until now the best solution is the use of a coating with antimicrobial properties. However, the coating is used up quickly and the continuous release of drugs could be harmful and increases the chances for resistance of bacteria.

Encapsulation of antibiotics into nano-reservoirs and the development of a trigger system able to decompose these containers only in the presence of bacteria would be a solution.

To attain this purpose we are synthesizing a conformationally unstable cyclohexane ring, which is kept in a metastable state by the interaction of complementary strands of DNA, with some degree of mismatch.

The presence of fully matching complementary single-stranded bacterial RNA, should break the interaction between the two not fully complementary strands of the cyclohexane. This should lead to a conformational change, due to sterical reasons. This change would allow then an intramolecular reaction, with liberation of a reactive leaving group.



Molecular modeling calculations showed that the two DNA single strands are effectively bounded and that the axial conformation is favorable.

Organic Chemistry **OC 96**

Synthesis of 6'-hydroxy bicyclo-[3.3.0] nucleosides

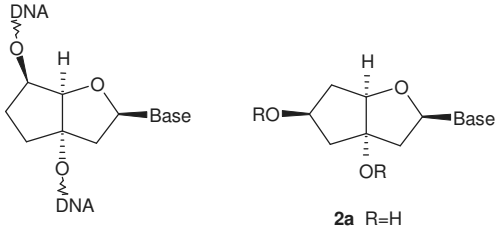
Anna-Barbara Gerber, Christian Leumann

Department of Chemistry and Biochemistry, University of Bern,

Freiestrasse 3, 3012 Bern, Switzerland

In the last two decades, a variety of modified nucleosides have been developed to improve antisense or siRNA oligonucleotide properties such as target affinity, nuclease resistance and pharmacokinetics. It is well established that conformational restriction leads to an enhancement in binding affinity and biostability due to an entropic advantage. In the context of conformational restriction our laboratory synthesized and characterized the analogue bicyclo-DNA **1**[1]. In continuation of this work we now envisaged the synthesis of 6'-hydroxy bicyclo nucleosides to investigate its structure-affinity relationship in complementary binding to DNA and RNA.

We present the synthesis of the building blocks containing the bases A, C, G and T (**2a**), the incorporation into DNA and their pairing properties.



1 **2a** R=H **2b** R=DNA

[1] M. Tarköy, M. Bolli, B. Schweizer, C.J. Leumann, *Helv. Chim. Acta*, **1993**, *76*, 481-510.

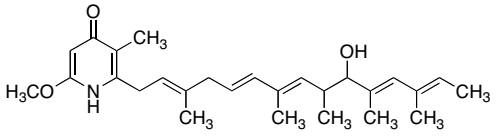
Organic Chemistry **OC 97**

Towards the Total Synthesis and Biological Evaluation of JBIR-02

Johannes Hoecker and Karl Gademann

Universität Basel, St. Johanns-Ring 19, 4056 Basel, Switzerland.

Natural sources remain the major inspiration for lead identification in anticancer research. The nuclear export inhibitor JBIR-02 from mycelium *Streptomyces sp*. ML55 (isolated from a soil sample collected in Taketomi Island, Japan)[1] was found to inhibit export of β-arrestin fusion protein by targeting the CRM1 nuclear transport protein.



JBIR-02

In the context of our program directed towards controlling protein transport in living cells,[2] the pyridone polyene JBIR-02 was identified as a promising lead structure. In addition, we have synthesized phenylpyridone polyenes with the goal of inducing neurite outgrowth.[3] In this context, we report our efforts towards the total synthesis, establishment of configuration, and biological profiling of this architecturally complex polyene pyridone.

[1] J. Ueda, T. Togashi, S. Matukura, A. Nagai, T. Nakashima, H. Komaki, K. Anzai, S. Harayama, T. Doi, T. Takahashi, T. Natsume, Y. Kisu, N. Goshima, N. Nomura, M. Takagi, K. Shin-ya, *J. Antibiot*. **2007**, *60*, 459-462.

[2] S. Bonazzi, O. Eidam, S. Güttinger, J.-Y. Wach, I. Zemp, U. Kutay, K. Gademann, *J. Am. Chem. Soc*. **2010**, *132*, 1432-442; J.-Y. Wach, S. Güttinger, U. Kutay, K. Gademann, *Bioorg. Med. Chem. Lett*. **2010**, *20*, 2843-2846.

[3] H. J. Jessen, A. Schuhmacher, T. Shaw, A. Pfaltz, K. Gademann, *Angew. Chem. Int. Ed*. **2011**, in print. Doi: 10.1002/anie.201007671.

Organic Chemistry **OC 98**

Organic electronic materials from oligopeptide-polymer conjugates

Holger Frauenrath, Ruth Szilluweit, Roman Marty

EPFL/Laboratory of Macromolecular and Organic Mateirals, Institute of Materials, EPFL – STI – IMX – LMOM, Building MXG, Room 039, Station 12, 1015 Lausanne, Email: roman.marty@epfl.ch

Hierarchically structured synthetic polymers containing monodisperse π-conjugated segments could offer intriguing perspectives for organic electronic devices such as OLEDs, OFETs, and organic solar cells. Previous investigations in our group revealed that a precise control of position, orientation, and reactivity of π-conjugated molecular fragments by directional non-covalent interactions, i.e. N-H···O=C hydrogen-bonding, is achieved. The investigated macromonomers gave rise to well-defined fibrillar features with a length of several micrometers, and a uniform width of a few nanometers.[1] A similar aggregation was found for symmetric oligopeptide-polymer conjugates bearing perylene bisimide as organic semiconducting segment. First, we prepared oligoalanine-polymer conjugates by solution-phase peptide chemistry using amine terminated poly(isobutylene) (PIB) as the polymer. Several different perylene bisimide derivates with 0–10 hydrogen-bonding sites were synthesized by a condensation reaction of the corresponding oligoalanine-PIB conjugates with perylene bisanhydride. The aggregation behavior was investigated by IR, CD, UV/VIS, and fluorescence spectroscopy. The derivative without any hydrogen-bonding sites is highly soluble in various organic solvents and showed a low tendency to aggregate via π-π-stacking. By contrast, the hydrogen-bonded derivatives show the formation of fibrillar aggregates that were visualized by AFM techniques. The fibrillar arrangement brings the π-conjugated segments in close contact so that nanowires with a well-defined charge percolation path should be obtained.

[1] E. Jahnke, N. Severin, P. Kreutzkamp, J. P. Rabe, H. Frauenrath, *Adv. Mater*. **2008**, 20, 409.

Organic Chemistry **OC 99**

A SNAP-based yeast three-hybrid screening for the target identification of anti-*Mycobacterium tuberculosis* drugs

Simone Moser, Hirohito Haruki, Kai Johnsson

Laboratory of Protein Engineering, Institute of Science and Chemical Engineering, EPFL, Lausanne

This study aims at identifying new drug targets against *Mycobacterium tuberculosis.* Tuberculosis is a worldwide menace, and the drugs that are applied for the treatment of the disease have been in use for decades. An urge exists for the identification of new drug targets against the causative bacterium, as multidrug resistant strains readily emerge during the conventional medication. Since the identification of protein targets of a small molecule drug is challenging, improved methods are asked that facilitate their discovery. With the recent development of an optimized yeast three-hybrid system in the Johnsson group[1] (see Fig. 1), the stage is set for its application to identify small molecule-protein interactions.

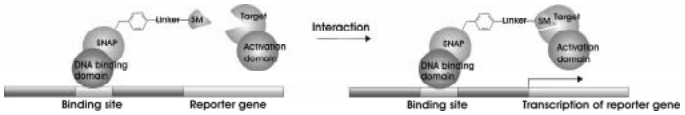


Figure 1: Three-hybrid system used in this work. Analogous to the yeast two-hybrid system, the interaction between a small molecule and a target protein leads to transcription of a reporter gene. The small molecule is conjugated to benzylguanine, which is coupled via the SNAP-tag technology to a DNA-binding protein.

Currently the system allows the screening of human cDNA libraries for small molecule-protein interactions in yeast. To apply this system for drug discovery against tuberculosis, genomic libraries of *M. tuberculosis* were constructed enabling the identification of mycobacterial proteins that bind to selected small molecules.

[1] C.Chidley, H.Haruki, M.G.Pedersen, E. Müller, K.Johnsson, *Nature Chem Biol* **2011**, doi:10.1038/nchembio.557

Organic Chemistry **OC 100**

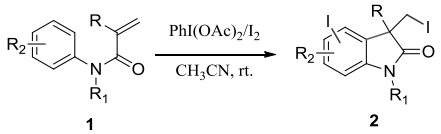
Iodo-Carbocyclization of Electron-Deficient Alkenes: Synthesis of Oxindoles and Spirooxindoles

Tiffany Piou,[†] Hai-Long Wei,[†] Jeremy Dufour,[†] Luc Neuville,[*,†] and Jieping Zhu[*,†,‡]

[†]Centre de Recherche de Gif, Institut de Chimie des Substances Naturelles, CNRS, 91198 Gif-sur-Yvette Cedex, France
[‡]Ecole Polytechnique Federale de Lausanne, EPFL-SB-ISIC-LSPN, CH-1015 Lausanne, Switzerland

3,3'-disubstituted oxindoles are highly valuable synthetic targets due to their presence in a wide range of biologically active products. We have been involved in the development of a palladium-catalyzed synthesis of oxindoles[1] and have recently reported an oxidative palladium-catalyzed carbo-heterofunctionalization of alkenes involving a direct aromatic C-H functionalization step.[2]

We report herein that a combination of two reagents, $PhI(OAc)_2$ and I_2, is capable of promoting the iodoarylation of α-substituted *N*-arylacrylamide derivates **1** to afford 3,3'-disubstituted oxindoles **2** under metal-free conditions.



1 **2**

To the best of our knowledge, this work constitutes the first examples of iodo-carbocyclization of electron-deficient olefins.

[1] (a) A. Pinto, L. Neuville, J. Zhu, *Angew. Chem. Int. Ed.* **2007**, *46*, 3291–3295. (b) S. Jaegli, W. Erb, P. Retailleau, J.-P. Vors, L. Neuville, J. Zhu, *Chem. Eur. J.* **2010**, *16*, 5863–5867.

[2] S. Jaegli, J. Dufour, H.-L. Wei, T. Piou, X.-H. Duan, J.-P. Vors, L. Neuville, J. Zhu, *Org. Lett*. **2010**, *12*, 4498–4501.

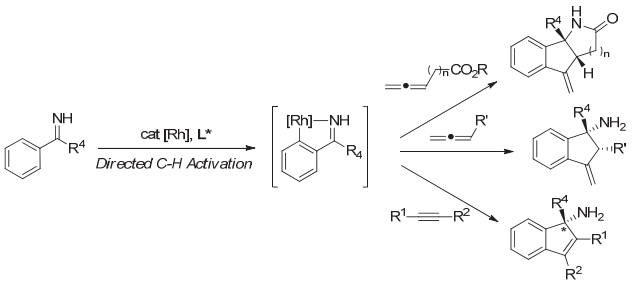
Organic Chemistry **OC 101**

Formal [3+2] Cycloaddition Initiated by Rhodium-Catalyzed C–H Activation

Duc N. Tran, Nicolai Cramer

Laboratory of Asymmetric Catalysis and Synthesis, EPFL SB ISIC LCSA BCH 4305, CH-1015 Lausanne, Switzerland

The direct functionalization of unactivated carbon-hydrogen bond has the potential to streamline synthesis. Such approach would offer several advantages like lack of pre-functionalization and simplicity of starting materials[1]. However, a broad application is still hampered by harsh reaction conditions, high catalyst loading and narrow substrate scopes. In particular, some popular directing groups, such as 2-pyridinyl group, are not practical from a synthetic point of view. Our research addresses these issues by developing versatile directing groups which can participate to a cascade transformation[2]. For instance, we present processes that allow controlling regio-, chemo-, diastereo- as well as enantioselectivity for the depicted reaction.



[1] Recent reviews: X. Chen, K. M. Engle, D.-H. Wang, J.-Q. Yu, *Angew. Chem. Int. Ed.* **2009**, 48, 5094; T. W. Lyon, M. S. Sanford, *Chem. Rev.* **2010**, 110, 1147.
[2] D. N. Tran, N. Cramer, *Angew. Chem. Int. Ed.* **2010**, 49, 8181.

Organic Chemistry **OC 102**

Synthesis of a *C*-Nucleotide modelled on 2,4-Diaminopyrimidine (D) as Nucleobase and the Thermodynamics of its Molecular Interactions

Caroline Roost, Jay S. Siegel

Institute of Organic Chemistry, University of Zurich, Winterthurerstr. 190, CH-8057 Zürich, Switzerland

DNA with its four building blocks **A**, **C**, **G**, and **T** is the carrier of genetic information in all known living organisms no matter how different they are. From which precursor did these nucleotides develop? This is a fundamental question in origin of live science.
A pre-biotic DNA alphabet consisting of only pyrimidine bases has been proposed (*Figure 1*) [1]. This alphabet contains a nucleoside (**D**) which easily can form **C** and **U** by hydrolysis (*Figure 2*).
To investigate this hypothesis, *C*-nucleoside **D** has been synthesised and incorporated into oligonucleotides. Now, isothermal titration calorimetry (ITC) experiments are planned to probe the thermodynamics of the molecular interactions between **D** and the natural nucleotides.

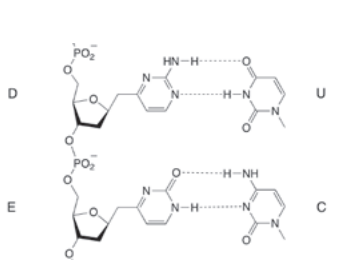


Figure 1: DNA, based on pyrimidine only.

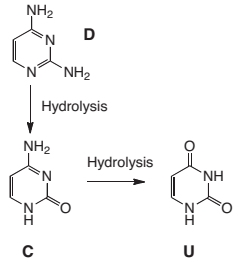


Figure 2: Hydrolysis of **D**.

[1] J. S. Siegel, Y. Tor *Org. Biomol. Chem.* **2005**, *3*, 1591.

Organic Chemistry **OC 103**

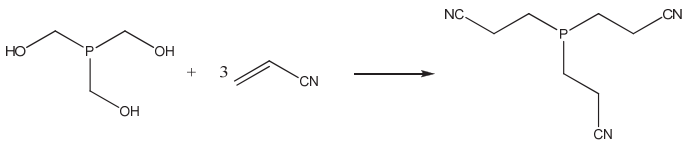
Study on the reactivity of THP (Tris(hydroxymethyl)phosphine)

Christelle Schenk[1], Dr. Olivier Vallat[2], Prof. Reinhard Neier[1]

[1]Institute of Chemistry, University of Neuchâtel, Av. Bellevaux 51, 2009 Neuchâtel, Switzerland
[2]Febex SA, route des Placettes, 1880 Bex, Switzerland

In the context of a CTI project (Commission for Technology and Innovation), a R&D collaboration was created between the Institute of Chemistry of Neuchâtel and Febex SA, a company specialized in higher value phosphorus derivatives. The purpose of the work is studying the reactivity of THP by developing new derivatives of this molecule.

THP proves to be a very nucleophilic phosphine and is able to react in various ways. At first, we are focusing on reactions with nitrogen sources by Mannish condensations and reactions with activated olefins by Michael additions. Good results are obtained with some olefins like acrylonitrile[1] (Scheme 1).



Scheme 1: Reaction of THP with acrylonitrile to form the trisubstitued derivative by Michael addition

[1] W.J. Vullo, *I&EC Product Research and Development,* **1966**, *5(4)*, 346.

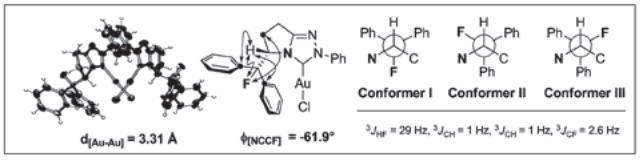
Organic Chemistry **OC 104**

A Novel Fluorinated Au(I) N-Heterocyclic Carbene Complex: Exploiting Fluorine Stereoelectronic Effects to Control Molecular Topology

Susann Paul, W. Bernd Schweizer, Marc-Olivier Ebert, and Ryan Gilmour*

Laboratorium für Organische Chemie, ETH Zürich, Wolfgang-Pauli-Strasse 10, 8093 Zürich, Switzerland

The synthesis of a novel fluorinated Au(I) N-heterocyclic carbene is disclosed together with solid-state and solution-phase conformational analysis. The potential of the fluorine gauche effect $[\sigma_{C-H} \rightarrow \sigma^*_{C-F}]$ for controlling the topology of catalytically relevant architectures is showcased by a representative NHC in which the C–F bond is β to the triazolium moiety.



[1] S. Paul, W. B. Schweizer, M.-O. Ebert and R. Gilmour, *Organometallics*, **2010**, *29*, 4424–4427.

Organic Chemistry **OC 105**

Proton-Catalyzed, Silane-Fueled Friedel–Crafts Aryl Coupling: Fluoroarene C–F Activation by Silyl Cations

Oliver Allemann, Simon Duttwyler, Paola Romanato, Kim K. Baldridge and Jay S. Siegel*

Organic Chemistry Institute, University of Zurich, Winterthurerstrasse 190, Zurich, CH-8057.

In terms of aryl-aryl couplings, Friedel–Crafts transformations are limited due to the thermodynamic instability of the phenyl cation. This fact gave rise to a large variety of coupling reactions using transition metal catalysts and activated arenes. Combining our group's knowledge about silylium ions in general[1] and our newest finding on carbon fluorine bond activation,[2] we now developed a method for an intramolecular Friedel–Crafts type coupling of an aryl fluoride with an unactivated aryl nucleophile without using a transition metal.[3] The activation of the C–F bond is achieved by a silyl cation and the driving force of the reaction is the high Si–F binding energy. The conditions used in our example reaction (Fig. 1), where only a catalytic amount of silylium ion was needed, could be successfully applied to several polyaromatic substrates.

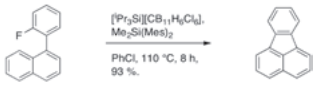


Fig. 1. Example reaction of the transformation of 1-(2-fluorophenyl)naphthalene to fluoranthene, using 10 mol% of silyl cation.

[1] S. Duttwyler, Q. Q. Do, A. Linden, K. Baldridge, J. Siegel, *Angewandte Chemie International Edition* ***2008****, 47, 1719*

[2] S. Duttwyler, C. Douvris, N. L. P. Fackler, F. S. Tham, C. A. Reed, K. K. Baldridge, J. S. Siegel, *Angewandte Chemie International Edition* ***2010****, 49, 7519*.

[3] O. Allemann, S. Duttwyler, P. Romanato, K. K. Baldridge, J. S. Siegel, *Science* ***2011****, accepted*.

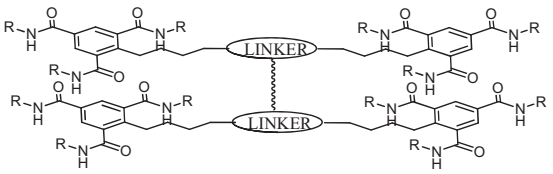
Organic Chemistry **OC 106**

Synthesis of benzene triamides dimer: Improving the self-organization in columnar mesophases.

Christian Invernizzi, Reinhard Neier

Institute of Chemistry, University of Neuchâtel, Av. De Bellevaux 51, case postale 158, 2000, Neuchâtel, Switzerland

Replacing of inorganic semiconductors is one of the most interesting challenges for organic chemists in the field of photovoltaic applications and electronical devices.[1] In that sense, benzene-tricarboxyamide (BTA) based Discotic Liquid Crystals showed very interesting properties.[2] Due to their intermolecular aromatic interactions and to three hydrogen-bonding sites per molecule, an impressive supramolecular assembly was created.[3]



Our idea consists in using the BTA moiety and in synthesizing dimer structures in order to increase the molecular assembly. Here we report our preliminary studies about BTA's "dimerization". The functionalization of benzene triamides is still in progress. In the future, we envisage the use of different types of linkers, as well as the study of the X-Ray 3D structure, in order to study the self-organization.

[1] Müllen. K., *Science*, **2001**, *293*, 1119
[2] Warren. J. E., *et al*., *Chem. Commun*, **1999**, 1945
[3] Sijbesma *at al*., *J. Am. Chem. Soc*. **2010**, *132*, 6892

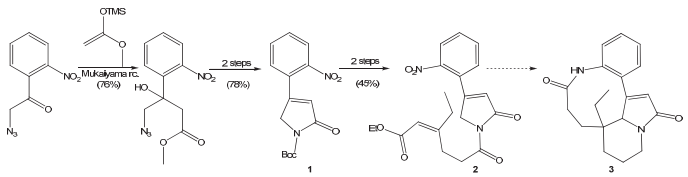
Organic Chemistry **OC 107**

Towards the Total Synthesis of Rhazinilam Analogue

Inga Zaitseva, Ana-Maria Buciumas, Olivier Vallat, Reinhard Neier*

Institut de chimie, Université de Neuchâtel, Av. de Bellevaux 51, 2009 Neuchâtel, Switzerland

R-(-)-Rhazinilam is an unusual monopyrrolic product isolated from nature in 1973.[1] The synthesis and properties of rhazinilam has been studied for more than 35 years.[2] This alkaloid shows significant *in vitro* cytotoxicity, but no activity was found *in vivo*.[3] Our synthetic strategy is to replace, in the first time, the pyrrole ring by a corresponding pyrrole-2(5*H*)-one ring[4] using the Mukaiyama crossed aldol reaction followed by the Staudinger reaction. The planned synthesis of rhazinilam analogues of type **3** from *N*-acylated pyrrolinone **2** should be available using the pyrrolinone activation followed by the intramolecular Michael addition reaction.



[1] H. H. A. Linde *Helv. Chim. Acta* **1965**, *48*, 1822.
[2] a) Kholod I.; Neier R. *Targets in Heterocyclic Systems* **2009**, 13, 252. b) Kholod I.; Vallat, O.; Buciumas, A.-M.; Neier, R. *Heterocycles* **2011**, *82*, 917.
[3] Baudoin O.; Guénard D.; Guéritte F.; *Mini-Rewiews in Organic Chemistry* **2004**, *1*, 333.
[4] Vallat O., Buciumas A.-M., Neels A., Stoeckli-Evans H.; Neier R. (2011. in preparation).

Organic Chemistry **OC 108**

Phosphate Hydrolysis Dynamics Reaction

Juvenal Yosa, Markus Meuwly*

Department of Chemistry, University of Basel, Klingelbergstrasse 80, CH-4056 Basel

The hydrolysis of phosphate ester is one of the most important biochemical processes in living systems, being involved in regulating protein function, energy production, signal transduction, replication of genetic material and many metabolic and signaling pathways [1]. Phosphate hydrolysis involve the direct displacement of a leaving group by hydroxide or water. Has been proposed that the reaction mechanism can proceed through three different pathways; associative, dissociative and concerted [2]. Here, we present an investigation of methylphosphate (MP) as a model system. MP reaction was proposed in 1955 such a dissociative mechanism and involve the formation of an intermediate monomeric metaphosphate ion (PO_3^-) in the first step [3]. The intermediate then react with water molecule which act as a nucleophile to yield the orthophosphoric acid monoanion ($H_2PO_4^-$). However, there is still controversy whether PO_3^- exist like a free diffusible species in water. Kinetic and stereochemical studies have indicated that free PO_3^- intermediates cannot be generated in protic solvent, however, the addition of explicit water molecules allows the formation of $H_2PO_4^-$ in the case of water cluster. Here we use Molecular dynamics to simulate the reaction of MP in a explicit water molecules. The results show that explicit water molecules decrease the activation energy compared with gas-phase, and also is key for the nuclephilic species formation (OH^-), allowing the reaction take place in picoseconds scale. This results could be extended to enzymatic reaction simulations and in systems where phosphate hydrolysis takes place.

[1] Westheimer, F. H. *Chem. Rev.*, **1981**, *81*, 313.
[2] Kamerlin, S. C. and Wilkie, J. *Organic and Biomolecular Chemistry*, **2007**, *5*, 1477.
[3] Butcher, W. W. and Westheimer, F. H.*J. Am. Chem. Soc.*, **1955**, *77*, 242.

Organic Chemistry **OC 109**

Pd-catalyzed C-H Insertion Reactions: A Mechanistic Study

Eirik Lyngvi and Franziska Schoenebeck*

ETH Zürich, Laboratory for Organic Chemistry, ETH Hönggerberg, CH-8093 Switzerland

C-C bonds are important structural components of nearly all organic molecules. A catalytic approach for the construction of carbon–carbon bonds that has received increased attention recently, involves the direct transformation of C-H bonds via C-H insertion processes.[1] Tremendous progress has been made in the development of such processes, but detailed mechanistic insights and reactivity guidelines are still rare.

We have applied a combined computational and experimental study to rationalize reactivities and selectivities of selected transformations in Pd-catalyzed C-H insertion reactions. We examined mechanisms, catalytic species, the origin of base-dependant selectivity reversals and studied pathways to further promote reactivities.

[1] For recent reviews, see: (i) T. W. Lyons, M. S. Sanford, *Chem. Rev.* **2010**, *110*, 1147-1169; (ii) K. Muniz, *Angew. Chem. Int. Ed.* **2009**, *48*, 9412-9423; (iii) J. C. Lewis, R. G. Bergman, J. A. Ellman, *Acc. Chem. Res.* **2008**, *41*, 1013-1025; (iv) I. A. I. Mkhald, J. H. Barnard, T. B. Marder, J. M. Murphy, J. F. Hartwig, *Chem. Rev.* **2010**, *110*, 890-931.

Organic Chemistry **OC 110**

Regio- and Chemoselectivity in Palladium Catalyzed Cross-Coupling Reactions

Fabien Proutiere and Franziska Schoenebeck*

ETH Zürich, Laboratory for Organic Chemistry, ETH Hönggerberg, CH-8093 Switzerland

Polysubstituted heterocycles are important building blocks for pharmaceutical and materials applications. Functionalization of the latter compounds via chemoselective and iterative cross-coupling reactions is a straightforward and attractive route to synthesize polysubstituted heterocycles.[1] However, frequently such protocols are not widely applicable and need to be empirically established for each specific substrate and coupling situation.

With a combination of computational, spectroscopic and experimental reactivity studies, we have performed detailed mechanistic investigations on the effect of ligand, solvent and additive on selected Pd-catalyzed transformations. We were able to gain insights on the active catalytic species and pathways of efficient pre-catalyst activation. As a result of these detailed investigations, a general protocol was developed to achieve highly selective cross-coupling reactions at room temperature in short reaction times.

[1] (a) A. F. Pozharskii, A. T. Soldatenkov, A. R. Katrizky, in Heterocycles in Life and Society; Wiley: New York, **1997**; (b) J. Reynolds, T. A. Skotheim, in Handbook of Conducting Polymers, 3rd ed.; CRC Press: Boca Raton, FL, **2007**; (c) for a review, see: S. Schroter, C. Stock, T. Bach, *Tetrahedron* **2005**, *61*, 2245.

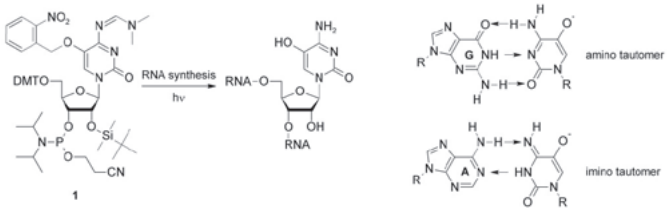
Organic Chemistry **OC 111**

5-Hydroxycytidine containing RNA

Pascal A. Küpfer, Christian J. Leumann

Department of Chemistry and Biochemistry, Freiestrasse 3, 3012 Bern, Switzerland

5-Hydroxycytidine (5hoC) has been shown to be a stable product of cytidine oxidation [1].



Due to its two different tautomeric forms, 5hoC can be expected to pair to G as well as A and therefore lead to erroneous or inefficient protein synthesis.
In a first part we succeeded to synthesize the 5hoC building block **1** where the 5-hydroxy group was protected with a photocleavable 2-nitrobenzyl moiety. The phosphoramidite was then incorporated into RNA and the 5-hydroxy group could successively be deprotected with UV light.
Melting experiments of RNA/RNA and RNA/DNA duplexes show that duplexes with 5hoC:G pairs are melting in two distinct transitions, giving rise to two T_m values. This behavior has been further shown to be pH independent (pH 5.5 - 8.5).
Further on we incorporated building block **1** into RNA templates and performed reverse transcription assays with HIV-1 RT, AMV-RT and MMLV-RT to elucidate the incorporation of the different dNTPs opposite the 5hoC lesion.

[1] Wagner, J. R. et al., *PNAS* **1992**, *89*, 3380.

Organic Chemistry **OC 112**

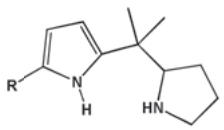
Synthesis and characterization of novel bifunctional molecules based on the pyrrole-pyrrolidine moieties

Anca Pordea, Reinhard Neier*

University of Neuchâtel, Institute of Chemistry, Av. Bellevaux 51, CP 158, 2000 Neuchâtel, Switzerland

The field of organocatalysis, as an alternative to metal-based and enzymatic catalysis, has known an important progress in the past decades. Most organocatalysts rely on interactions such as H-bonding or ion pairing and are currently bifunctional (e. g. contain a Lewis base and a Brønsted acid).[1]

We recently discovered the high potential for the formation of inter- and intramolecular hydrogen bonds in half-reduced calix[4]pyrrole derivatives.[2]. We report here on the synthesis and characterization of novel molecules containing both the pyrrole (H-bond donor, Brønsted acid) and the pyrrolidine (H-bond acceptor, Lewis base) moieties (Figure 1). The potential of these novel molecules as organocatalysts will be presented.



R: -C=O, $-CF_3$

[1] Peter I. Dalko, Lionel Moisan, *Angew. Chem. Int. Ed.* **2004**, *43*, 5138.
[2] Guillaume Journot, unpublished results.

Organic Chemistry **OC 113**

Oligo(ethynylene) Rotaxanes as Models for Carbyne

Martin Fritzsche, Tobias Hoheisel, Holger Frauenrath

Laboratory of Macromolecular & Organic Materials (LMOM), EPFL, Station 12, MXH 130, 1015 Lausanne, Switzerland

Since the discovery of fullerenes, the research for new and unusual carbon allotropes has been a prosperous field of research. While sp^3- and sp^2-hybridzed carbon allotropes, such as diamond, graphite, graphene, fullerenes, and carbon nanotubes, are abundant, even the most simple "unusual" allotrope of carbon, the *sp*-hybridized, linear allotrope "carbyne" has so far remained elusive because its high reactivity [1]. Even short oligo(ethynylene)s readily undergo "carbonization" in their condensed phase and, until now, almost all synthetic approaches are limited to oligo(ethynylene)s with sterically demanding end groups [2]. Our strategy to kinetically stabilize such molecules is to form "insulated molecular wires" (IMWs) with α-cyclodextrins in order to shield the reactive oligo(ethynylene segments in the form of rotaxanes [3]. Starting from amphiphilic and appropriately functionalized oligo(ethynylene) precursors [4], we were able to prepare and characterize various monodisperse cyclodextrin-based oligorotaxanes in protic polar solvents.

[1] F. Diederich, P. J. Stang, R. R. Tykwinski, Editors, *Acetylene Chemistry: Chemistry, Biology and Material Science*, Wiley-VCH, Weinheim, **2005**.
[2] S. Kim, *Angew. Chem. Int. Ed.* **2009**, *48*, 7740.
[3] J. Sugiyama, I. Tomita, *Eur. J. Org. Chem.* **2007**, *2007*, 4651.
[4] T. N. Hoheisel, H. Frauenrath, *Org. Lett.* **2008**, *10*, 4525.

Organic Chemistry **OC 114**

Synthesis of a Hydrogen-Bonded Quaterthiophene and its Use in Organic Field-Effect Transistors with High Charge Carrier Mobilities

Jan Gebers, Stéphane Suárez, Holger Frauenrath*

École Polytechnique Fédérale de Lausanne (EPFL)
Laboratory of Macromolecular and Organic Materials (LMOM)
Building MXG, Station 12, 1015 Lausanne, Switzerland

Supramolecular self-assembly represents a convenient pathway to create optoelectronic materials from monodisperse π-conjugated oligomers. Our work focuses on the preparation of novel oligothiophenes bearing substituents capable of hydrogen-bonding to enhance crystalline order, optimize the π-π stacking interaction, and, thus, improve their electronic properties. Here, we present an improved synthetic pathway towards amine-substituted oligothiophenes and the synthesis of a quaterthiophene diacetamide. This hydrogen-bonded quaterthiophene was found to exhibit remarkably high charge carrier mobilities in organic field-effect transistors when deposited on SiO_2 at elevated substrate temperatures and slow evaporation speeds.

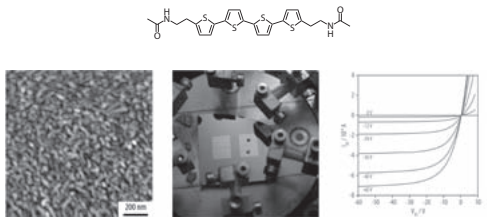


Figure 1. Top: Structure of the quaterthiophene diacetamide; bottom: atomic force microscopy image of a film deposited by vapor deposition (left), optical photograph of a transistor (middle), and typical output curves of the transistor (right).

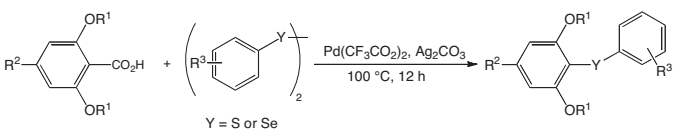
Organic Chemistry **OC 115**

Syntheses of Unsymmetrical Hindered Diaryl Sulfides and Selenides by Palladium-Catalyzed Decarboxylative Reactions

Jean-Michel Becht and Claude Le Drian

Institut de Science des Matériaux de Mulhouse (IS2M) – LRC CNRS 7228
15 rue Jean Starcky, F-68057 Mulhouse cedex

Palladium-catalyzed reactions offer the most powerful route for the formation of carbon-carbon (or carbon-nitrogen) bonds with high yields under mild conditions. Recently, carbon-sulfur bonds were also formed by reaction beween aryl iodides (or bromides) and arylthiols.
The cheap and easily available arenecarboxylic acids have been used as substiutes for the expensive arylboronic acids for Suzuki-Miyaura couplings [1] but they can also be used to replace the aryl halides in other palladium-catalyzed reactions. We present here a simple and efficient route to unsymmetrical hindered diaryl sulfides from electron-rich 2,6-disubstituted arenecarboxylic acids. This methodology has been successfully extended for the first time to the formation of carbon-selenium bonds.[2]



[1] J.-M. Becht, C. Catala, C. Le Drian, A. Wagner, *Org. Lett.* **2007**, *9*, 1781; J.-M. Becht, C. Le Drian, *Org. Lett.* **2008**, *10*, 3161.
[2] J.-M. Becht, C. Le Drian, *J. Org. Chem.* accepted.

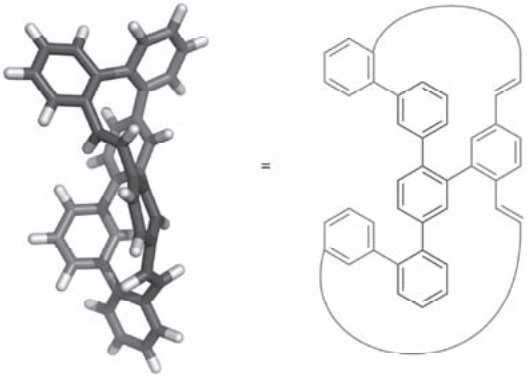
Organic Chemistry **OC 116**

Emission with a Twist – Towards a New Geländer-Type Oligomer

Michel Rickhaus and Marcel Mayor

University of Basel, St. Johanns-Ring 19, CH-4056 Basel, Switzerland

Polyaromatic hydrocarbons are a promising set of molecules for the investigation of how chirality relates with structure. This project deals in the synthesis of a Geländer-type oligomer consisting solely of carbon and hydrogen. The assemblies of the key fragments are presented. This novel oligomer is believed to possess strong chiroptical properties while not being subject to fast racemization or forming an optically mute *meso* form, as it is the case with other Geländer oligomers. Especially the proposed capability of emitting circular polarized light is an essential feature towards POLEDs and stereoscopic displays.



Organic Chemistry **OC 117**

A FRET-based Biosensor for the Neurotransmitter Acetylcholine

Alberto Schena, Kai Johnsson

Swiss Federal Institute of Technology, CH-1015, Lausanne, Switzerland

Direct detection and quantification with high spatial and temporal resolution of small metabolites (M) in living organisms can help in better characterizing their interaction with the target biomolecules and to study the role of specific substances in their metabolic pathways. Our sensor concept is based on a binding protein (BP) able to specifically and selectively bind to the metabolite of interest as well as to a tethered ligand (TL). A FRET-pair and the TL are chemically synthesized and covalently linked to the BP in a correct geometry by SNAP and CLIP self-labeling tags. Increasing the M concentration, the sensor switches from a closed form, where the TL is intramolecularly bound, to an open form. A change in distance and orientation within the FRET-pair leads to a ratiometric FRET-ratio change related to the M concentration. Several advantages over the existing biosensors are achieved: a single fusion protein can be labeled with different FRET-pairs; modulating the affinity of the TL to the BP allows to change the dynamic range of the sensor; the sensor can be selectively targeted on the outer cell surface by using non-cell permeable compounds; no conformational change of the BP is required. A sensor for the key neurotransmitter acetylcholine (ACh) is under development, based on the enzyme acetylcholinesterase as BP and some of its competitive, non-covalent inhibitors as tethered ligands. The sensor characterization *in vitro* and expression on the outer cell surface of mammalian cells, can make possible the determination of ACh concentration directly in living cells.

[1] Brun M. A. Tan K.-T Nakata, E. Hinner M. J.; Johnsson, K. *JACS*, **2009**, *131-16*, 5873-5884.

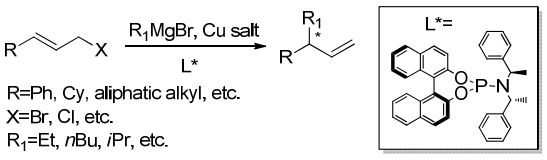
Organic Chemistry **OC 118**

New Substrates In Copper (I)-Catalyzed Asymmetric Allylic Alkylation

Alexandre Alexakis*, Hailing Li

University of Geneva, 30 Quai Ernest Ansermet, 1211 Geneva, Switzerland

The allylic alkylation is a fundamental C-C bond formation reaction; and the copper-catalyzed asymmetric allylic alkylation (AAA) is one of the most powerful methods to introduce a simple alkyl group in allylic position [1]. Copper is particularly known to induce a high γ-selectivity stemming from a S_N2' process. This work focused on developing the novel substrates in the asymmetric allylic alkylation in the presence of easily-prepared phosphoramidite ligands[2]. In the catalytic system, the chiral γ-adducts can be formed from the prochiral substrates highly regio- and enantioselectively.



[1] a) A. Alexakis, J. E. Bäckvall, N. Krause, O. Pamies, M. Dieguez, *Chem. Rev.* **2008**, *108*, 2796; b) C. A. Falciola, A. Alexakis, *Eur. J. Org. Chem.* **2008**, 3765.
[2] Tissot-Croset, K.; Polet, D.; Alexakis, A. *Angew. Chem. Int. Ed.* **2004**, *43*, 2426.

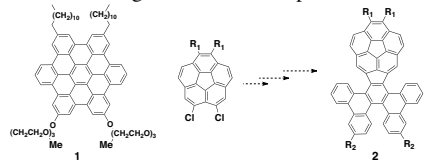
Organic Chemistry **OC 119**

Towards supramolecular aggregation, bilaterally symmetric corannule derivatives

A.K.Dutta,J.S.Siegel*

Institute of Organic Chemistry, University of Zurich, Winterthurstrasse 190, CH- 8050, Zurich, Switzerland

Corannulene is a bowl shaped molecule, with a large π-conjugated surface area and therefore great potential to form ordered materials.[1] Uncovering the driving factors that lead corannulene derivatives to form columnar-stacks is of current interest. Only two derivatives of corannulene are reported so far that are able to form a liquid crystalline assembly; however, close congeners of corannulene, like the planar coronene and hexa-*peri*-hexabenzocoronene (HBC, **1**) derivatives, assemble and form liquid crystals and π-electronic nanotubular objects,[2] respectively. By virtue of its non-planar geometry, corannulene provides some unique features, e.g. polyaromatic hydrocarbon with dipole moment, solution phase bowl inversion which are not provided by planar π-conjugated analogous. Indenocorannulenes form columnar slip-stacks in crystalline state. The large surface area of indenocorannulene derivatives with proper functionalization, could be instrumental in the formation of supramolecular aggregates with exciting material applications. Synthesis of a variety of bilaterally symmetric indenocorannulene derivatives **2** and their π-stacking behavior will be presented.



1. Wu, Y. T.; Bandera, D.; Maag, R.; Linden, A.; Baldridge, K.K.; Siegel, J. S. *J. Am. Chem. Soc.* **2008**, *130*, 10729.
2. Aida, T.; Fukushima, T.; Hill, J. P.; Jin, W.; Kosaka, A. *Science* **2004**, *304*, 1481.

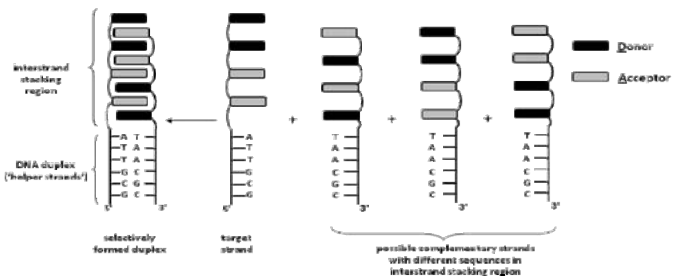
Organic Chemistry **OC 120**

Investigation of Selectivity of Aromatic Stacking Interactions

Christian Winiger and Robert Häner

Departement of Chemistry and Biochemistry, University of Bern Freiestrasse 3, CH-3012 Bern

The structure and stability of double stranded DNA is given by a selective base pairing via H-bonding and a stacking of the aromatic nucleobases. Thereby the stacking of the bases is mainly responsible for the stability of the double strand whereas the specific H-bonds between the bases (Adenosine pairs with Thymidine and Cytosine pairs with Guanosine) are responsible for the selectivity.
The present project focuses on bioconjugates composed of DNA and aromatic dyes. The main goal is to drive both, stability and selectivity of unnatural double stranded DNA by intercalation of aromatic dyes. A short natural DNA stem acts as scaffold to preorientate the dyes. Recent work by our group showed that short DNA parts could induce a helical chirality of larger non-natural stacked aromatic parts. This leads to a transfer of chirality information from natural DNA parts to unnatural parts. Further investigations may lead to the design of DNA-like aromatic systems with increased thermodynamic stability and a selective aromatic pairing.



Organic Chemistry **OC 121**

Force Fields for Organocatalysis: Structure and dynamics of Ir complexes

Franziska Hofmann, Markus Meuwly*

Department of Chemistry, University of Basel, Klingelbergstrasse 80, CH-4056 Basel

Efficient calculation of transition metal complexes, used in asymmetric catalysis e.g, in hydrogenation reactions, is of major interest in organic chemistry. The development of a catalyst requires an accurate way to predict relative energies and activation barriers for multiple diastereomers. As this information is not readily available from experiment for all relevant diastereomers, computational methods play an essential role. However, density functional theory (DFT)-based approaches are very time consuming and more efficient strategies are requiered for screening. One such approach is VALBOND[1] which is based on valence bond theory.[2] For more quantitative studies, VALBOND TRANS[3] has been developed which also includes the trans influence of ligands on bond lengths and relative energies as part of the computations. In the present contribution, the VALBOND TRANS force field is generalized for model octahedral complexes containing Ir, so that DFT relative energies for different diastereomers can be reproduced. For this, the mulliken charges and the vdW parameters[4] of the Ir-complexes were fitted with INolls[5] to scrutinize the method and the parameters obtained are then used for chemically related compounds to examine their transferability.

[1] Root, D. M., Landis C. R., Cleveland T., *J. Chem. Phys.*, **1993**, *66*, 27.
[2] Pauling, L., *The Nature of the Chemical Bond*, **1960**, *NY: Cornell University Press.*
[3] Tubert-Brohman, I., Schmid, M., Meuwly, M., *J. Chem. Theory. Comput.*, **2009**, *5*, 530.
[4] Devereux, M., Meuwly M., *J. Chem. Inf. Model.*, **2010**, *50*, 349.
[5] Law, M., Huston J., *J. Chem. Chem.*, **1997**, *102*, 252.

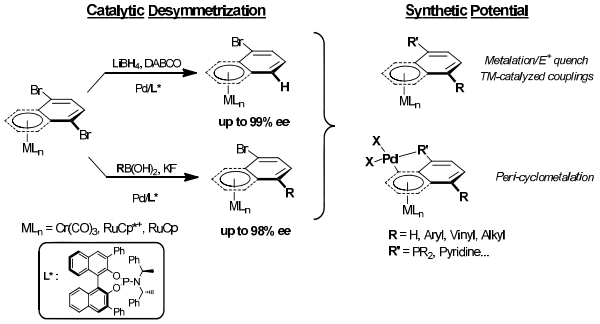
Organic Chemistry **OC 122**

Efficient Catalytic Asymmetric Entry to Planar Chiral Complexes

Simon Wagschal, Audrey Mercier, E. Peter Kündig

Department of Organic Chemistry, University of Geneva
30 Quai Ernest Ansermet, 1211 Geneva 4, Switzerland

Optically pure planar chiral complexes are of interest for both asymmetric synthesis and catalysis. We here report on an easy access to highly enantioenriched compounds *via* desymmetrization of prochiral dibromoarene complexes using a bulky chiral palladium catalyst[1,2].



[1] Cr complexes: (a) Urbaneja, X.; Mercier, A.; Besnard, C.; Kündig, E. P. *Chem. Commun.* **2011**, *47*, 3739-3741. (b) Mercier, A.; Urbaneja, X.; Yeo, W. C.; Chaudhuri, P. D.; Cumming, G. R.; House, D.; Bernardinelli, G.; Kündig, E. P. *Chem. Eur. J.* **2010**, *16*, 6285-6299.
[2] Ru complexes: (a) Mercier, A.; Yeo, W. C.; Chou, J. Y.; Chaudhuri, P. D.; Bernardinelli, G.; Kündig, E. P. *Chem. Commun.* **2009**, 5227-5229. (b) Mercier, A.; Yeo, W. C.; Urbaneja, X.; Kündig, E. P. *Chimia* **2010**, *64*, 177-179.

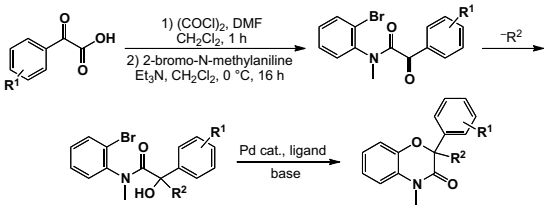
Organic Chemistry **OC 123**

The Preparation of Benzoxazinones via Intramolecular Carbon-Oxygen Bond Formation

Kai E. O. Ylijoki and E. Peter Kündig

Department of Organic Chemistry, University of Geneva, Quai Ernest Ansermet 30, 1211 Geneva 4, Switzerland

The benzoxazinone moiety is a prevalent core structure in both natural products and pharmaceuticals.[1] An array of methodologies for the synthesis of this structural unit have been developed, the majority of which rely on the coupling of *o*-nitro- or *o*-aminophenols with α-haloesters. While very versatile, these techniques are restricted in the degree of substitution that can be incorporated at the 2-position in the final product, and achieving high levels of stereocontrol is difficult. As an extension of our interest in the preparation of 3-hydroxyoxindoles,[2] we have investigated the preparation of benzoxazinone products via intramolecular Buchwald-Hartwig etherification. Through this method, we have prepared an array of compounds bearing electron-rich, electron-poor, and sterically demanding aromatic groups, as well as alkyl substituents. In addition, examples of 2,2-disubstituted complexes arising from tertiary alcohol substrates can also be obtained.



[1] a) Ilaš, J.; Anderluh, P. S.; Dolenc, M. S.; Kikelj, D. *Tetrahedron* **2005**, *61*, 7325. b) Macías, F. A.; Marín, D.; Oliveros-Bastidas, A.; Molinillo, J. M. G. *Nat. Prod. Rep.* **2009**, *26*, 478.
[2] Jia, Y.-X.; Katayev, D.; Kündig, E. P. *Chem. Commun.* **2010**, *46*, 130.