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Swiss Science Concentrates

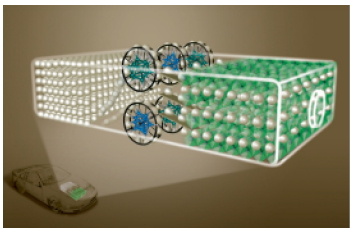
A CHIMIA Column

Short Abstracts of Interesting Recent Publications of Swiss Origin

A Stable 3 V All-Solid-State Sodium–Ion Battery Based on a *closo*-Borate Electrolyte

Léo Duchêne, Ruben-Simon Kühnel, Evelyn Stilp, Eduardo Cuervo Reyes, Arndt Remhof,* Hans Hagemann, and Corsin Battaglia, *Energy Environ. Sci.* **2017**, *10, 2609.* Empa, University of Geneva

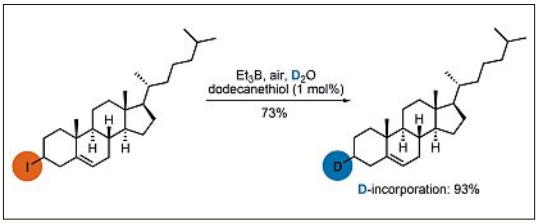
Rechargeable all-solid-state batteries have the potential to provide higher energy density and improved operational safety. Several classes of solid-state electrolytes with high ionic conductivity have been previously reported, but unresolved compatibility issues between electrodes and the solid-state electrolyte have prevented their integration into a useful battery cell. Duchêne, Remhof and co-workers have successfully integrated a mixed-ion sodium *closo*-borate electrolyte into a stable 3 V battery containing a $NaCrO_2$ cathode and a sodium metal anode. To achieve high cycling stability, a solution-based interface engineering method was used to create a stable contact between the cathode and solid-state electrolyte. The high thermal and electrochemical stabilities demonstrate the potential of *closo*-borate electrolytes for all-solid-state batteries.



Radical Deuteration with D_2O: Catalysis and Mechanistic Insights

Valentin Soulard, Giorgio Villa, Denis Patrick Vollmar, and Philippe Renaud*, *J. Am. Chem. Soc.* **2018**, *140*, 155. University of Bern

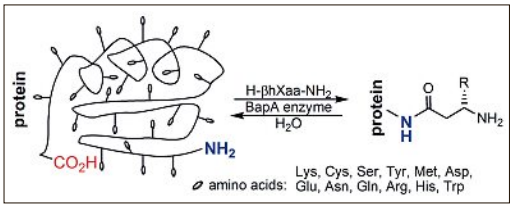
With the recent FDA approval of deutetrabenazine (Austedo) for the treatment of tardive dyskinesia, the enhanced pharmacokinetic properties provided by certain kinetic isotope effects have finally proven their utility in the clinic. Unfortunately, access to deuterated drugs is currently limited by traditional deuteration reactions that rely on toxic, harsh, and/or expensive reagents such as D_2SO_4. Soulard, Vollmar and Renaud have shown that an *in situ*-generated thiol catalyzes the xanthate deoxygenation reaction initially reported by Wood *et al.* With this knowledge, they developed a mild method for the deuteration of alkyl iodides using D_2O. Renaud and co-workers now wish to pursue enatioselective deuteration reactions.



N-Terminal Protein Modification by β-Peptidyl Aminopeptidase-Catalyzed Attachment of β-Amino-Acid Residues

Beata Kolesinska, Joanna Wasko, Zbigniew Kaminski, Birgit Geueke, Hans-Peter E. Kohler, and Dieter Seebach*, *Helv. Chim. Acta* **2018**, *101*, e1700259. ETH Zürich

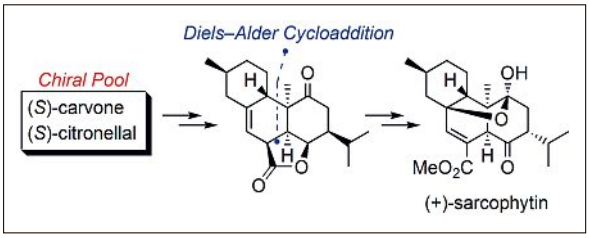
Post-translational modifications, *e.g.* phosphorylation or methylation, play important roles in mediating the biological properties of peptides and proteins. Prof. Seebach and co-workers discovered that a β-peptidyl aminopeptidase (3-2W4-BapA) allows for selective and reversible attachment of β-amino acids to the *N*-termini of α-peptides and proteins. BapA exhibits preference for the (*S*)-enantiomers of acylating β-amino acids. By adding an excess of racemic H-(β^3hAla)-NH_2 amide as the acyl donor, only the (*S*)-enantiomer was found to be attached to the *N*-termini of human insulin. This approach for achieving post-translational modification should be applicable to a wide range of proteins and β-amino acids, potentially improving the biological half-life and/or imaging of peptides and proteins *in vivo*.



Total Synthesis of (+)-Sarcophytin

Leonardo J. Nannini, Suren J. Nemat, and Erick M. Carreira*, *Angew. Chem. Int. Ed.* **2018**, *57*, 823. ETH Zürich

A highly convergent total synthesis of (+)-sarcophytin has been accomplished by Nannini, Nemat, and Carreira which led to the reassignment of the previously misreported absolute configuration of the isolated natural product. At the heart of their retrosynthetic approach was a disconnection approach that fully forwent strategic bonds with stereochemical variables such as susceptibility towards epimerization. Their approach utilized an unusual, intramolecular Diels-Alder reaction between two tethered, electron-deficient partners (enone and a dienoate). The endgame involved a reaction cascade, including lactone opening, alcohol oxidation, and ketone epimerization to complete the first total synthesis of (+)-sarcophytin. The Carreira group is now exploring the synthesis of other cembranoid natural products with intriguing biological properties.



Prepared by Aaron Johnson, Ashkan Karimi, Claire L. Lin, Verena Schreier, and Nathan W. Luedtke*

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Please contact nathan.luedtke@chem.uzh.ch