



Swiss Science Concentrates

A CHIMIA Column

Short Abstracts of Interesting Recent Publications of Swiss Origin

Taming Lanthanide-Centered Upconversion at the Molecular Level

Y. Suffren, B. Golesorkhi, D. Zare, L. Guénée, H. Nozary, S. V. Eliseeva, S. Petoud, A. Hauser, and C. Piguet*, *Inorg. Chem.* **2016**, doi:10.1021/acs.inorgchem.6b00700. University of Geneva

Because of the high probability of fast non-radiative relaxation of excited states in coordination complexes, lanthanide-centered molecular upconversion has been considered impossible for many years. Piguet and collaborators now show that molecular lanthanide-containing coordination complexes may be judiciously tuned to overcome these limitations and to induce near infrared

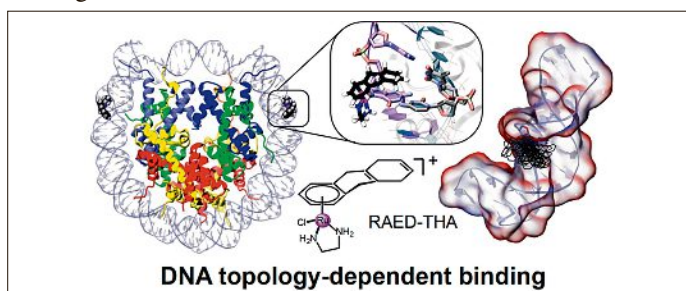


to visible light upconversion *via* the successive absorption of two low-energy photons using linear-optical responses. Even though the single-ion-centered, excited-state absorption remains difficult to implement in lanthanide complexes, the skillful design of intramolecular intermetallic energy-transfer processes in multimetallic architectures enables erbium-centered molecular upconversion.

An Organometallic Compound which Exhibits a DNA Topology-Dependent One-Stranded Intercalation Mode

Z. Ma, G. Palermo, Z. Adhireksan, B. S. Murray, T. von Erlach, P. J. Dyson, U. Röthlisberger*, and C. A. Davey*, *Angew. Chem. Int. Ed.* **2016**, 55, 7441. EPF Lausanne

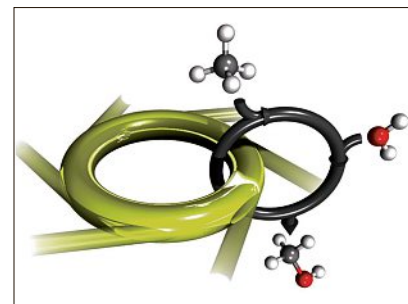
Because of their cytotoxic, mutagenic and therapeutic potential, intercalator compounds have been extensively studied for decades. Yet, little is known regarding their interaction with nucleosomes. Using crystallographic methods and molecular dynamics simulations, Röthlisberger, Davey and collaborators, describe the adduct of RAED-THA, a tetrahydroanthracene (THA) ruthenium complex, to the nucleosome. The adduct exhibits a novel, one-stranded intercalation and DNA distortion when binding to packed DNA while no intercalation is found for free DNA strands. The newly observed DNA binding mode and topology dependence should be considered when studying covalently binding intercalators.



Isothermal Cyclic Conversion of Methane into Methanol over Copper-exchanged Zeolite at Low Temperature

P. Tomkins, A. Mansouri, S. E. Bozbag, F. Krumeich, M. Bum Park, E. M. C. Alayon, M. Ranocchiari, and J. A. van Bokhoven*, *Angew. Chem. Int. Ed.* **2016**, 55, 5467. ETH Zurich, PSI Villigen

The direct production of methanol from methane and oxygen remains a challenge. Van Bokhoven and coworkers now report the use of copper-containing zeolites for the conversion of methane to methanol in a cyclic process under isothermal conditions. Copper-exchanged zeolite is activated with oxygen at 200 °C, reacts with methane, and is subsequently extracted with steam. The advantage of the new process is the isothermal condition, whereas previously, high-temperature activation was needed. Characterization of the activated catalyst revealed that the active sites are small clusters of copper, indicating that catalysts can be designed with greater flexibility than formerly proposed.



A General Strategy for the Semisynthesis of Ratiometric Fluorescent Sensor Proteins with Increased Dynamic

L. Xue, E. Prifti, and K. Johnsson*, *J. Am. Chem. Soc.* **2016**, 138, 5258. EPF Lausanne

Ratiometric fluorescent sensors are powerful tools for the non-invasive quantification of analytes in living cells and complex biological samples. Johnsson and coworkers demonstrate that the combination of self-labelling protein tags with unnatural amino acids permits the semisynthesis of ratiometric fluorescent sensor proteins with an unprecedented dynamic range. In an advanced version of the *Snifit* technology, CLIP-tag is replaced by a fluorophore-labelled, unnatural amino acid. The resulting fluorescent sensor proteins exhibit large dynamic ranges as shown for methotrexate both *in vitro* and on cell surfaces. The performance of the *uSnifit* method renders it attractive for applications in basic research and diagnostics.

