



Swiss Science Concentrates

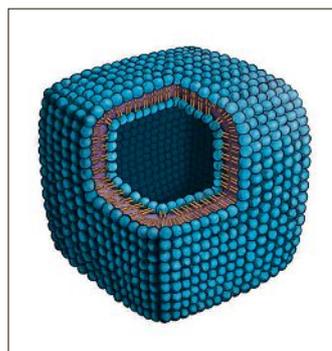
A CHIMIA Column

Short Abstracts of Interesting Recent Publications of Swiss Origin

Vesicle Origami: Cuboid Phospholipid Vesicles Formed by Template-Free Self-Assembly

F. Neuhaus, D. Mueller, R. Tanasescu, S. Balog, T. Ishikawa, G. Brezesinski, and A. Zumbuehl*, *Angew. Chem. Int. Ed.* **2017**, *56*, 6516. University of Fribourg

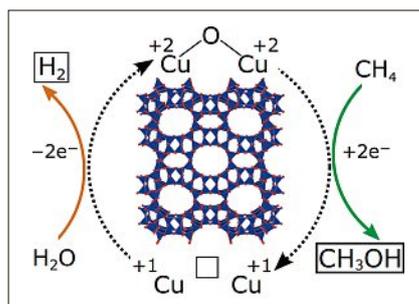
Phospholipids typically self-assemble into spherical vesicles in aqueous medium. Only few examples of lipid systems are known which form non-spherical structures. Deciphering the bilayer code, the basic physical interactions between phospholipids, would allow to utilize these molecules as building blocks for novel structures. Zumbuehl and co-workers present in this paper a 1,2-diamidophospholipid that self-assembles into a cuboid



structure. The bilayer membranes form a remarkably tight subgel packing due to intermolecular hydrogen bonding, which then leads to maximization of flat structural elements and minimization of any edges. Unexpectedly, the lateral surface pressure in the membrane is only one third of the value typically assumed for a bilayer membrane, questioning a long-standing rule-of-thumb.

Selective Anaerobic Oxidation of Methane Enables Direct Synthesis of Methanol

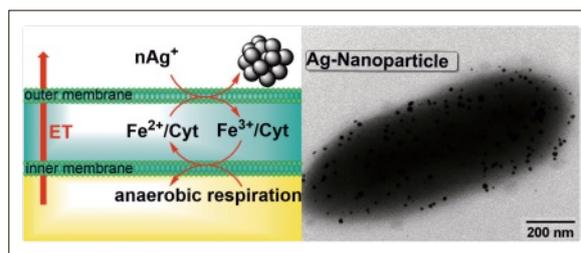
V. L. Sushkevich*, D. Palagin, M. Ranocchiari, J. A. van Bokhoven*, *Science* **2017**, *356*, 523. PSI Villigen, ETH Zürich
Efficient methods for the direct functionalization of methane into commodity chemicals and liquid fuels remain a key challenge. Sushkevich, van Bokhoven and coworkers present a step-wise method for converting methane into methanol. The partial oxidation with water over a copper-containing zeolite proceeds with high selectivity. Isotopic labelling confirmed that water acts as the source of oxygen to regenerate the zeolite active centres and also renders methanol desorption energetically favourable. A mechanism involving methane oxidation at Cu^{II} oxide active centres, followed by Cu^I reoxidation by water with concurrent formation of hydrogen is proposed. The use of water instead of oxygen may contribute to the development of an industrial process for the direct conversion of methane to methanol.



Formation of Silver Nanoparticles by Electron Transfer in Peptides and c-Cytochromes

S. I. Vasylevskiy, S. Kracht, P. Corcosa, K. M. Fromm*, B. Giese*, and M. Füeg, *Angew. Chem. Int. Ed.* **2017**, *56*, 5926. University of Fribourg

Microbial respiration processes in bacteria are gaining relevance for the synthesis of metal nanoparticles from metal salts. The reduction of Ag⁺ ions to Ag⁰ atoms is a highly endergonic reaction step, only the aggregation to Ag_n clusters leads to an exergonic process. Fromm, Giese and coworkers studied the formation of AgNPs in peptides by photoinduced electron transfer (ET), and in c-cytochromes by ET from their Fe²⁺/hemes. They observed that AgNPs can be easily synthesized with less efficient Ag⁺-binding amino acids than histidine. The ability of Fe²⁺/hemes of c-cytochromes to reduce Ag⁺ to AgNPs was studied in an enzymatic experiment and with living bacteria (*Geobacter sulfurreducens*).



Selective *In Vivo* Removal of Pathogenic Anti-MAG Autoantibodies, an Antigen-Specific Treatment Option for Anti-MAG Neuropathy

R. Herrendorff, P. Hänggi, H. Pfister, F. Yang, D. Demeestere, F. Hunziker, S. Frey, N. Schaeren-Wiemers, A. J. Steck, and B. Ernst*, *Proc. Natl. Acad. Sci. U.S.A.* **2017**, *114*, E3689. University of Basel

Anti-MAG (myelin-associated glycoprotein) neuropathy is a disabling autoimmune disorder which affects the peripheral nervous system. It is caused by monoclonal IgM autoantibodies that recognize the carbohydrate epitope HNK-1 (human natural killer-1). Existing therapies are mostly immunosuppressive and are not sufficiently effective. Ernst and coworkers designed a glycopolymer which acts as an autoantibody scavenger by mimicking the natural HNK-1 glycoepitope. It selectively neutralizes pathogenic antibodies in patient sera and, moreover, removes them in an immunological mouse model of anti-MAG neuropathy. The presented glycopolymer is an important step towards an antigen-specific therapy for anti-MAG neuropathy.

