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# Swiss Science Concentrates

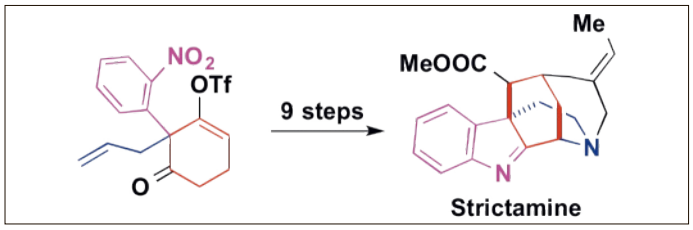
## A CHIMIA Column

Short Abstracts of Interesting Recent Publications of Swiss Origin

### Total Synthesis of (±)-Strictamine

W. Ren, Q. Wang, and J. Zhu*, *Angew. Chem. Int. Ed.* **2016**, *55*, 3500. EPF Lausanne

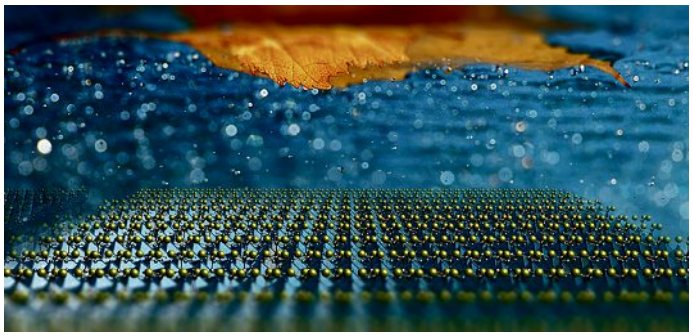
Akuammiline alkaloids display a wide variety of biological properties, including antibacterial, anticancer, anti-inflammatory, antitussive, and antimalarial activities. The presence of a C7–C16 bond creates a rigid and cage-like framework and, for years, their complex molecular architectures have presented significant challenges for synthetic chemists. Zhu and coworkers now report the first total synthesis of strictamine. Their method involves the creation of a C7 all-carbon quaternary stereocenter at an early synthetic stage, whereas the indolenine unit is constructed at a late stage. Although the yield of the final cyclization step is low, the synthesis is straightforward and the target compound was obtained in only nine steps from a known enol triflate.




### High-Performance Perovskite Solar Cells with Enhanced Environmental Stability Based on Amphiphile-Modified $CH_3NH_3PbI_3$

D. Bi, P. Gao*, R. Scopelliti, E. Oveisi, J. Luo, M. Grätzel, A. Hagfeldt, and M. K. Nazeeruddin*, *Adv. Mater* **2016**, *28*, 2910. EPF Lausanne, Sion

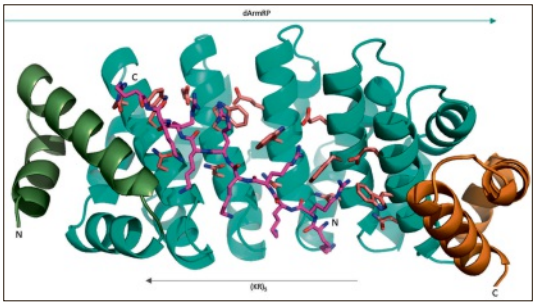
Lead halide-based perovskite solar cells (PSCs) can reach a power conversion efficiency (PCE) of over 20%. Among several critical challenges, however, ambient stability of PSCs represents an important issue for practical applications. Gao, Nazeeruddin and collaborators now report that the use of a fluorinated amphiphilic additive (FEAI) in $MAPbI_3$ perovskite enhances the environmental stability of PSCs without sacrificing their performance. A significantly enhanced PCE from 15.6% to 18.0% was achieved by introducing 3 mol% FEAI. Importantly, moisture resistance is enhanced due to the hydrophobic $CF_3$ terminal group, which is a new paradigm of improving environmental stability of PSCs.



### Structure and Energetic Contributions of a Designed Modular Peptide-Binding Protein with Picomolar Affinity

S. Hansen, D. Tremmel, C. Madhurantakam, C. Reichen, P. R. E. Mittl*, and A. Plückthun*, *J. Am. Chem. Soc.* **2016**, *138*, 3526. University of Zürich

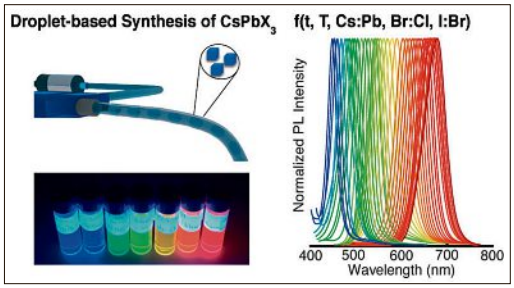
Natural armadillo repeat proteins (nArmRP), like importin-α or β-catenin, bind their target peptides by modular interaction of each repeat with a dipeptide unit of the target. However, this modularity is imperfect and restricted to short stretches of continuous peptide. Through extensive protein engineering, Plückthun, Mittl and coworkers have designed a regularized and truly modular peptide-specific binding protein based on designed armadillo repeat proteins (dArmRP). The modular behaviour of the interaction is demonstrated by a position-independent, exponential dependence of the affinity on peptide and dArmRP lengths. The modular binding mode was further proved by a 1.83 Å resolution crystal structure of a dArmRP in complex with the cognate $(KR)_5$ peptide.



### Synthesis of Cesium Lead Halide Perovskite Nanocrystals in a Droplet-Based Microfluidic Platform: Fast Parametric Space Mapping

I. Lignos, S. Stavrakis, G. Nedelcu, L. Protesescu, A. J. deMello*, and M. V. Kovalenko*, *Nano Lett.* **2016**, *16*, 1869. ETH Zürich and EMPA Dübendorf

Nanocrystals of cesium lead halide perovskite ($CsPbX_3$) exhibit bright and tunable photoluminescence. Our understanding of the parameters governing the formation of these nanocrystals, however, is still very limited. deMello, Kovalenko and coworkers present a droplet-based microfluidic platform that serves as a unique tool for studying and optimizing the reaction parameters of the colloidal synthesis of $CsPbX_3$ nanocrystals, thus enabling the production of materials with superior photoluminescence characteristics. The early-stage insight into the mechanism of nucleation of metal halide nanocrystals suggests similarities with multinary metal chalcogenide systems, albeit with much faster reaction kinetics.

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