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Swiss Light Source Research Highlights

Photonic structure of white beetle wing scales: optimized by evolution

B. D. Wilts, X. Sheng, M. Holler, A. Diaz, M. Guizar-Sicairos, J. Raabe, R. Hoppe, S.-H. Liu, R. Langford, O. D. Onelli, D. Chen, S. Torquato, U. Steiner, C. G. Schroer, S. Vignolini, A. Sepe, Adv. Mater. 1702057 (2017), DOI: 10.1002/adma.201702057

A very thin layer on this beetle's wings exhibits a complicated structure on the nanoscale that gives them a bright white color. X-ray nanotomography acquired at the Swiss Light Source provides a faithful image of this structure in three dimensions with which scientists can confirm its evolutionary optimization: just enough material for an efficient reflection of white light.

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Diving into magnets

Claire Donnelly, Manuel Guizar-Sicairos, Valerio Scagnoli, Sebastian Gliga, Mirko Holler, Jörg Raabe, Laura J. Heyderman, Nature 20 July 2017, DOI: 10.1038/nature23006

For the first time, scientists have made visible the directions of the magnetisation inside a 3D magnetic object. The smallest details in their visualisation were ten thousand times smaller than a millimetre. Among others, the magnetic structure contained one outstanding kind of pattern: magnetic singularities called Bloch points, which up to now were only known in theory.

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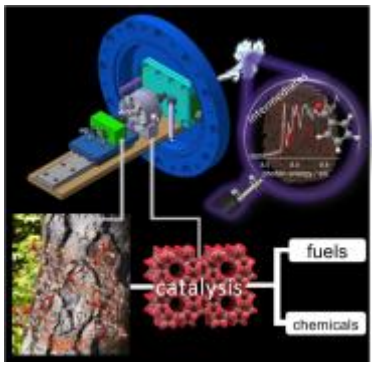
Understanding the reaction mechanism in lignin catalytic fast pyrolysis

Patrick Hemberger, Victoria B.F. Custodis, Andras Bodi, Thomas Gerber, Jeroen A. van Bokhoven, Nature Communications, 29 June 2017, DOI: 10.1038/ncomms15946



Lignin is a major constituent of plants, and may be used as a precursor for fuels and fine chemicals. Catalytic fast pyrolysis of lignin is one of the most promising approaches. By using vacuum ultraviolet synchrotron radiation and threshold photoelectron spectroscopy we could identify elusive intermediates, which are responsible for the formation of phenol and benzene and could thus tackle this reaction mechanism. Mechanistic understanding could enable targeted improvement of production methods in the future, beyond the currently used "cook-and-look" approach.

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