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ANCIENT HUMANS WERE PIGMENT CHEMISTS

Bright yellow and red iron oxides known as ochre found in deposits on Earth have long been used as pigments—for example, by early humans to paint their bodies and other objects. Now, archaeologists have discovered a 100,000-year-old ochre-processing workshop in a South African coastal cave, the oldest such site, by 40,000 years, found to date (Science, DOI: 10.1126/science.1211535). Discoveries at the cave document early humanity’s “deliberate planning, production, and curation of a pigmented compound and the use of containers,” notes the research team led by Christopher S. Henshilwood of the University of Bergen, in Norway. “Homo sapiens [of that era] thus also had an elementary knowledge of chemistry and the ability for long-term planning,” the researchers conclude. The team uncovered evidence that these early humans ground the ochre from rock and heated bones to extract fat and marrow that were then used as a binder for the pigments. Charcoal was also sometimes added to the mixture. The ancient paint was then placed in sealed abalone shells for storage.—JNC

LINEAR ALKANES POLYMERIZE ON GOLD

Long-chain alkanes can polymerize predictably at moderate temperatures on a corrugated gold surface, according to researchers in Germany who made the discovery (Science, DOI: 10.1126/science.1211836). The work adds to the growing list of catalytic transformations mediated by gold and could lead to less expensive polymers by avoiding functionalized starting materials such as alkenes. The study also highlights the mechanistic role of molecular-scale surface structure in reactions involving solid catalysts. The University of Münster’s Dingyong Zhong, Harald Fuchs, Lifeng Chi, and coworkers report that 1.22-nm-wide grooves as drop rotation comes from the difference in surface tension between the drop and CTAB solution.—JK

LIFELIKE DROPLETSS DO THE DISSOLVING DANCE

Drops of dichloromethane develop varying shapes, from circles to polygons, and show complex and dynamic behavior patterns as they dissolve into aqueous solution, according to a study (Angew. Chem. Int. Ed., DOI: 10.1002/anie.201104261). A group led by Véronique Pimienta of France’s Paul Sabatier University and Oliver Steinbock of Florida State University added 25-μL drops of dichloromethane into aqueous cetyltrimethylammonium bromide (CTAB) solutions. They found that what happens next depends on the CTAB concentration. On the surface of 0.5-mM CTAB, for example, a circular dichloromethane drop initially pulsates and ejects smaller droplets from its edge. It then starts rotating, developing two arms from which more droplets release, before eventually breaking apart and disappearing. On 30-mM CTAB, in contrast, the spherical rim of the drop morphs into polygonal structures with mobile vertices that release smaller droplets when they collide. The researchers believe drop movement is driven by thermal gradients that develop with evaporation, whereas drop rotation comes from the difference in surface tension between the drop and CTAB solution.—SE

SUPRISE ROUTE TO PEPTOID NANOSHEETS

Nanosheets composed of amphiphilic peptoids (peptide analogs) assemble by an unexpected mechanism that may be applicable to other types of nanosheets. Peptoid nanosheets were first reported last year (C&EN, April 19, 2010, page 7). Their potential applications include sensing, templating, filtering, molecular recognition, and catalysis. Ronald N. Zuckermann and coworkers at Lawrence Berkeley National Laboratory’s Molecular Foundry, who developed the nanosheets, initially believed they form by a nucleation and growth mechanism in which small peptoid oligomers act as “seeds” for nanosheet assembly. They now find instead that amphiphilic peptoids align at the air-water interface to create monolayers, and that surface compression, which occurs when the vial is shaken, causes the monolayers to collapse into nanosheets (J. Am. Chem. Soc., DOI: 10.1021/ja206199d). In the nanosheet bilayer, hydrophilic groups are on the outer surface and hydrophobic groups are inside. Nanosheet formation is irreversible, so more than 95% of peptoids in solution can be converted. This preparative route may also be useful in making nanosheets from other building blocks, Zuckermann says.—SB

Amphiphilic peptoids (red is a hydrophilic surface, yellow is a hydrophobic surface) align at an air-water interface (top). Surface compression (dark gray blocks, middle) then induces nanosheet formation (bottom). The researchers found that what happens next depends on the CTAB concentration. On the surface of 0.5-mM CTAB, for example, a circular dichloromethane drop initially pulsates and ejects smaller droplets from its edge. It then starts rotating, developing two arms from which more droplets release, before eventually breaking apart and disappearing. On 30-mM CTAB, in contrast, the spherical rim of the drop morphs into polygonal structures with mobile vertices that release smaller droplets when they collide. The researchers believe drop movement is driven by thermal gradients that develop with evaporation, whereas drop rotation comes from the difference in surface tension between the drop and CTAB solution.—JK

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