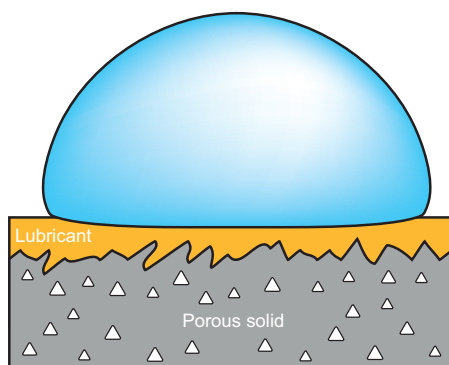


## BIOINSPIRED MATERIALS

### Pitcher plant perfect

Nature **477**, 443–447 (2011)

NATURE 477, 412–413 (2011); © 2011 NPG



Coatings able to repel liquids are a promising way to improve a wide variety of materials, from biomedical devices to self-cleaning structures, and considerable research has been dedicated to mimicking the lotus leaf — an excellent non-wetting material. But such surfaces, patterned with a regular texture on top of which water droplets sit without wetting it, do not efficiently repel organic liquids. Now,

mimicking the leaves of the carnivorous pitcher plant instead, Joanna Aizenberg at the University of Harvard and co-workers have prepared very slippery omniphobic surfaces, which repel both aqueous and organic liquids.

A porous material with a micro- or nanotexture that is not necessarily regular, in this case made of either polyfluoroalkyl silane or Teflon, is first impregnated with a lubricating liquid. The lubricant chosen, a perfluorinated oil that is immiscible with both aqueous and organic liquids, fills the material's microstructure — adhering to it sufficiently so as not to be displaced at a later stage by the liquid to be repelled — and forms a continuous film on the surface.

The resulting lubricant coating creates a smooth surface with very low friction, making for an efficient repellent against a variety of aqueous and organic liquids, even blood and crude oil. Furthermore, it is not affected by ice, and can self-heal — areas that have been physically damaged (for example by abrasion) are refilled as long as the lubricant is present within the porous substrate. The slippery liquid-infused porous surfaces, as Aizenberg and colleagues call them, are also efficient even under high

pressure, and judicious choice of the substrate and lubricant leads to an omniphobic material that is optically transparent. *AP*

## MECHANOCHEMISTRY

### Tearing apart triazoles

Science **333**, 1606–1609 (2011)

The copper-catalysed cycloaddition between an azide and an alkyne to form a five-membered triazole ring is perhaps the most well-known — and well-used — example of so-called click chemistry. The reaction is typically fast, occurs under mild conditions, exhibits a very high level of chemoselectivity and produces stable products. These characteristics have led to this particular reaction being used for many different applications, ranging from the labelling of biological macromolecules through to the patterning of surfaces.

But now, Chris Bielawski and co-workers from the University of Texas at Austin have shown that triazoles can be 'unclicked' using mechanochemistry, to form the separate alkyne and azide components. Long polymer chains were grown from either side of a triazole and a solution of the compound was exposed to ultrasound. Collapsing bubbles

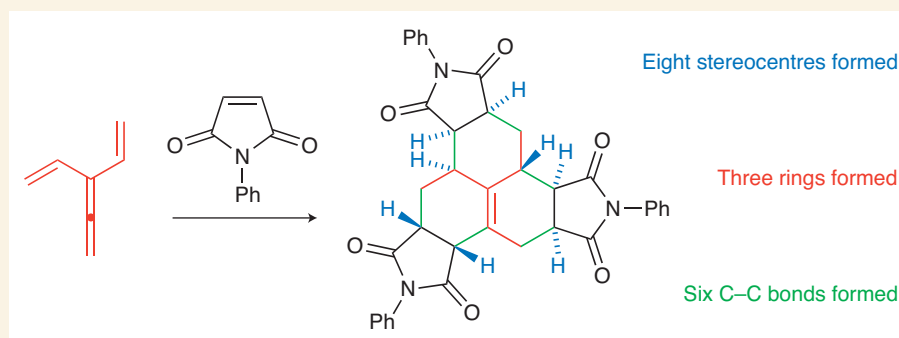
## $\pi$ -BOND-RICH HYDROCARBONS

### Cycloaddition cascade

Angew. Chem. Int. Ed. <http://dx.doi.org/10.1002/anie.201105541> (2011)

Synthetic methods that rapidly create molecular complexity from simple molecules are greatly prized. Highly unsaturated hydrocarbon structures, for example, are often extremely reactive. This reactivity can make them difficult to isolate — but when that is possible, they can become the basis for surprisingly simple routes to complex molecules. Now, Michael Sherburn and co-workers from the Australian National University along with Michael Padden-Row from the University of New South Wales, have isolated 1,1-divinylallene for the first time, and performed some initial experiments on its reactions.

There are only a few examples of such  $\pi$ -bond-rich hydrocarbons not stabilized by steric protection. Previous attempts by other researchers to prepare 1,1-divinylallene had resulted in isolation of a rearranged product. Sherburn and co-workers suspected that this was as a result of the high-temperature requirements of the methodology used, and



first confirmed this by performing accurate *ab initio* calculations. These calculations suggested that in concentrated solution, 1,1-divinylallene would have a half-life of only minutes. After several failed attempts, they identified a method — with the key step being a Grieco–Sharpless elimination from a selenide — of preparing their target in dilute solution and at low temperature.

In a demonstration of the synthetic utility of such highly unsaturated molecules,

Sherburn and co-workers then showed that this molecule could react in a cascade of three Diels–Alder reactions. The molecule acts as the diene partner for the reaction in each case, with each cycloaddition occurring at a chemically distinct site, and in the process creates a new diene for the next part of the cascade. This cascade creates six carbon–carbon bonds, three rings and eight stereocentres in a single step. *SD*