

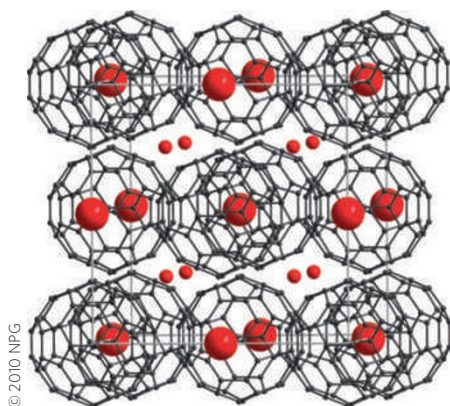
recognition sites and a measurable increase in the impedance was detected. Structurally similar horse apoferritin and horse ferritin gave no significant response when tested, highlighting the selectivity of the sensor to human ferritin.

The technique was also used to create a selective sensor for human papillomavirus-derived protein and one that could discriminate between conformational states of the protein calmodulin, which changes conformation on binding calcium ions.

FULLERIDE SUPERCONDUCTORS

Determined by distance

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Alkali metal fullerides form cubic structures where the C_{60} molecule acts as an anion in face- or body-centred cubic lattices, and show superconducting behaviour at relatively high temperatures of around 30–40 K. The three-dimensional nature of these superconducting materials differs from the well-known cuprates, which superconduct through two-dimensional copper–oxygen layers. The fullerides therefore offer more scope to study the effect of crystal structure on superconducting properties.

Now, an international team led by Matthew Rosseinsky from the University of Liverpool and Kosmas Prassides from Durham University have shown how dependent the formation of superconducting states is on the spatial arrangement of the two ions. The team studied the face-centred cubic (fcc) polymorph of Cs_3C_{60} . Unlike other fcc alkali metal fullerides, and its body-centred (bcc) polymorph, it is not a superconductor at ambient pressure. The application of a few kilobars of pressure, however, leads to the compound becoming a superconductor at around 30 K.

The application of pressure leads to a reduced unit-cell volume, fitting with the

observation of superconductivity in other alkali metal fullerides with smaller volumes than Cs_3C_{60} . Plotting the temperature at which superconducting behaviour occurs (T_c) for a range of compounds and pressures against volume shows a distinct correlation, with a dome-shaped curve peaking around 760 \AA^3 per fulleride. Although the fullerides' cubic symmetry is the key to superconducting behaviour, it is the separation between the anions that determines T_c .

FINE CHEMICALS

Nature's catalogue

Angew. Chem. Int. Ed. **49**, 5510–5514 (2010)

Oil is a limited resource. And it is not just a fuel — if efforts to reduce the world's dependence on oil are to be successful, then chemists will need a new source for many fine chemicals. The fine chemicals in question are the small building blocks that are taken for granted when placing an order with one's favourite chemical company. Biofeedstocks — including wood and grass plants — are a good source of carbohydrates and typically comprise a highly oxygenated six-carbon species. Much work has focused on their conversion into so-called platform chemicals, from which more attractive building blocks can then be derived. Procedures for such further conversion, however, are less developed.

Now, Jürgen Klankermayer, Walter Leitner and their co-workers from RWTH Aachen University and the Max-Planck-Institut für Kohlenforschung report the ruthenium-catalysed conversion of platform chemicals levulinic acid and itaconic acid into more useful species. The rationale for the processes resembles a retrosynthetic analysis except that the products get progressively simpler. Applying this allowed the team to synthesize building blocks such as γ -valerolactone (GVL) and 2-methyltetrahydrofuran (2-MTHF) — and many other closely related compounds — using a ruthenium-catalysed hydrogenation.

A mechanistic analysis of the process was used to optimize the reaction conditions, additives and ligands allowing different products to be obtained. Thus, levulinic acid and itaconic acid were selectively converted to a diverse set of lactones, diols and cyclic ethers.

The definitive versions of these Research Highlights first appeared on the *Nature Chemistry* website, along with other articles that will not appear in print. If citing these articles, please refer to the original web version.

blogroll

Got your number

A look at academic family trees branches out to consider whether chemists need to take a leaf out of mathematicians' book of numbers.

Academic lineages — tracing your 'family tree' back through your supervisor's supervisor's supervisor's supervisor's... (you get the picture) — were raised by Jeremy on the ChemBlog (<http://go.nature.com/HmZNSb>) and carried on by Sam on Everyday Scientist (<http://go.nature.com/Ndhxoh>). Jeremy has traced his "as far back as Breslow", but Sam goes a good few steps further. Climbing his PhD supervisor's tree, he passes Helmholtz and Leibniz's father on as far as Gerard van Swieten (1700–1772). Using the roots of his postdoc adviser he gets to Justus von Liebig and then even further, to Niccolò Leoniceo in the fifteenth century. For those interested in researching their own trees, the ChemBlog suggests several chemistry departments that have resources, including the University of Texas at Austin (<http://go.nature.com/DwoEXJ>) and the University of Illinois at Urbana-Champaign (<http://go.nature.com/ri4DSe>).

Some of the comments on the Everyday Scientist post alert readers to the concept of the Erdős number (<http://www.oakland.edu/enp>) in mathematics. If someone co-wrote a paper with prolific mathematician Paul Erdős, they are given an Erdős number of 1. Those who have co-written a paper with such individuals have an Erdős number of 2, and so on. Is there a chemist who has been prolific enough in a range of disciplines to be a useful measure in our own fair subject? Discussion raged in our office, with suggestions including Pauling, Woodward, Cotton, Grubbs, Whitesides and so on — all of whom are identifiable without a first name! Unfortunately, we can't think of any single chemistry candidate who quite fits the bill. Maybe each sub-discipline needs its own champion, and we should pick a recent Nobel Laureate in each area. So physical chemists could have an Ertl number, inorganic chemists a Schrock number and organic chemists a Sharpless number. Get on to Web of Science and start calculating your numbers!