to be important in the conversion of CO and H_2 into hydrocarbons — known as the Fischer–Tropsch (FT) reaction.

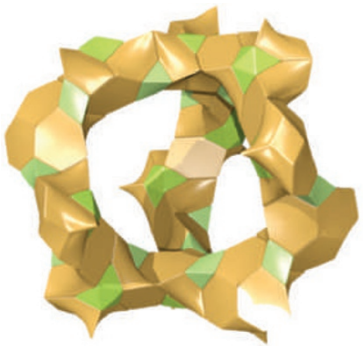
Cobalt is a well-studied FT catalyst and previous research has shown that, although particle size has no effect on those that are between approximately 10 and 200 nm, smaller particles show slower performance and a higher selectivity for producing methane rather than longer hydrocarbons. Now Krijn de Jong and colleagues from Utrecht University, in collaboration with the Norwegian University of Science and Technology, have revealed the origin of these phenomena.

Using a technique to measure the surface coverage and residence time of the important reaction species CO, OH_x and CH_x, they observed that the reduction in activity for smaller particle size is related to CH_x covering less of the surface, and being there longer. This was caused by more CO molecules binding irreversibly to and blocking the reactive corner and edge sites, which increase in fraction as the nanoparticles become smaller. Smaller particles therefore have a proportionally higher surface coverage of hydrogen, which explains why they have an increased selectivity for methane.

ZEOLITES

Prodigious pores

Nature **458,** 1154–1157 (2009)



Zeolites are microporous materials that usually have pore sizes below 5 nm; those with larger, more mesosized (up to 50 nm) pores are much rarer, but would be useful in many applications. Avelino Corma and colleagues from the Instituto de Tecnología Química in Valencia, working in collaboration with Xiaodong Zou and colleagues from Stockholm University, have now made a zeolite with extra-large pores. The pores follow a single gyroidal channel and the material is chiral.

An organic structure-directing agent — a multicyclic diquaternary ammonium molecule — was used as a template to form the germanosilicate zeolite. Zou and colleagues devised a new strategy to discover the complex structure of the zeolite, because it wasn't stable enough in the electron beam for accurate transmission electron microscopy. Instead, they combined selected-area electron diffraction and powder X-ray diffraction, and used a charge-flipping algorithm to solve the structure.

This revealed a single gyroidal channel, the first observed in a chiral zeolite. It has a lower framework density than similar materials and an exceptionally high surface area. The work demonstrates the usefulness of both non-surfactant structure-directing agents and the new characterization method, as well as showing that zeolite pore sizes can approach the mesopore range.

AMMONIA BORANE

Improving capacity

Chem. Mater. **21,** 2315–2318 (2009);
Proc. Natl Acad. Sci. USA **106,** 8113–8116 (2009)

Hydrogen has a much greater energy density than gasoline by mass, but a much lower one by volume, hindering its wider use as a fuel. The US Department of Energy has a target of 9 wt% for onboard hydrogen storage by 2015. Ammonia borane (NH_3BH_3) has a hydrogen content of 19 wt% and has been investigated extensively as the material to meet the challenge. Releasing hydrogen from NH_3BH_3, however, is problematic: kinetic barriers require temperatures above 100 °C and side products such as borazine hamper the process.

Ping Chen and colleagues from the Dalian Institute of Chemical Physics in China have now incorporated cobalt and nickel catalysts into NH_3BH_3. At a loading of only 2 mol%, these do not reduce the hydrogen capacity significantly, and allow 5.8 wt% hydrogen to be released at temperatures around 60 °C. It also reduced the amount of borazine formed — none could be detected. The material itself also suffered less from deformation.

Ho-kwang Mao of the Carnegie Institution of Washington and co-workers have used high pressure to incorporate more hydrogen into ammonia borane. At around 6 GPa under a hydrogen atmosphere, between one and two molecules of extra hydrogen were absorbed per molecule of ammonia borane. Crushing the solid improved its contact with hydrogen and thus the rate at which it was taken up. This extra capacity raised the level of hydrogen in the material to around 30 wt%, giving increased hope that this material could feature in the hydrogen-storage devices of the future.

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 web version.

blogroll

A textbook example

Textbooks only evolve slowly — that's why the classics age so well.

What's your favourite textbook? The bulky undergraduate text that brings back memories of all those exams that you had to sit, or the slim and expensive monograph for grappling with more esoteric slices of chemistry? Do you prefer the dusty black and white classic or the full-colour, DVD-appended latest release? Wavefunction at The Curious Wavefunction (http://bit.ly/BhPhm) confesses to having "long been addicted to classic textbooks". He goes on to regret that many people regard them as outdated, and bets that "no modern undergraduate that I [have met] has browsed Pauling's classic *The Nature of the Chemical Bond*". Its significance is underlined not only by its 16,000 citations in the first ten years after publication, but by "constantly finding new papers in journals like *Science* and *Nature* that still cite it".

On the same topic, Thomas Sutton Hall of Sabbatical Epistles (http://bit.ly/rg7Qn) posts about his impressive collection of chemistry texts, which date back to the 1790s. He focuses on those books that themselves focus on organic chemistry — his speciality — and finds that even after 130 years they're very similar. Apart from the increased use of figures and colour, Hall says that the "only major change in my opinion was the introduction of mechanism into the texts". Although hot topics come and go, the functional group approach has stood the test of time. He suggests that it could be possible to track the half-life of past Nobel Prizes, and the likelihood of future awards, by their coverage in organic texts.

Worried about an upcoming PhD defence/viva? Have you ever wondered what a graph of the resulting mood swings would look like? No? Well, Female Science Professor (http://bit.ly/ezQh8) did, and plotted the "dimensionless mood number" over the 50 days leading up to the big day one of her student. There are more lows than highs, but it stops short of plotting the final high of passing.