is the leaving group and a new alkene is produced ready for cross-metathesis. Although the resulting boronates are useful products in their own right, Park and McQuade also describe oxidative conversion of the boronates to alcohols, thus giving the polyhydroxyl product.

Much of the method optimization is conducted for the production of diols and, unlike many alternative methods, provides access to both diastereomers with high yield and stereoselectivity. Furthermore, it is possible to protect the alcohol product after each complete iteration. This is used to good effect in the synthesis of a protected D-*arabino*-tetrol and a differentially protected L-*ribo*-tetrol. *SD*

ODOUR DETECTION

Smelling sulfur

Proc. Natl Acad. Sci. USA **109,** 3492–3497 (2012)

We all know that sulfurous compounds are smelly — think rotten eggs and food waste — and humans are very sensitive to them, being able to sense small volatile thiols down to 0.3 ppb. How they are detected, however, is not fully understood, but it has been suggested that metal ions could play a role. Now, a team led by Hiroaki Matsunami from Duke University Medical Centre, and Hanyi Zhuang from Shanghai Jiao Tong University, have shown that copper is essential for mice to be able to smell (methylthio)methanethiol (CH_3SCH_2SH; MTMT), a chemical in the urine of male mice that attracts females.

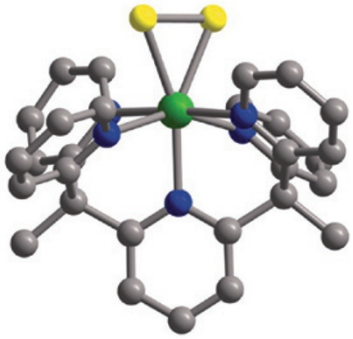
Matsunami, Zhuang and colleagues screened 219 mouse odorant receptor proteins to find those responsive to MTMT. To do this they measured the chemiluminescence of a luciferase reporter, which indirectly responded to the activation of odorant receptors. The receptor MOR244-3 responded strongly to MTMT and was therefore used subsequently to study the effects of metal ions on receptor activation. The addition of Cu^{2+} to the system increased the activation of MOR244-3 but this was not the case on addition of several other metal ions. The effect of Cu^{2+} was also confirmed by the addition of tetraethylenepentamine — a copper chelator that binds to and thus removes free Cu^{2+}. This caused the receptor to stop responding, proving that copper is necessary for MTMT sensing.

Matsunami, Zhuang and colleagues also investigated a series of MTMT analogues and the effect of receptor mutations. The researchers suggest that the copper ions mediate the 'detection' process, by perhaps binding to the sulfurous ligands and altering their conformation, before they can both bind to the receptor. *GA*

HYDROGEN-EVOLUTION CATALYSTS

Molybdenum mimic

Science **335,** 698–702 (2012)



In common with many heterogeneous catalysts, the bulk of molybdenum disulfide is relatively inactive compared with the surface, which is effective for industrial hydrodesulfurization reactions. MoS_2 nanoparticles have also been proposed as cheaper alternatives to platinum for the photo/electrocatalytic production of hydrogen from water. The active surfaces are believed to feature molybdenum atoms bonded to disulfide units, forming an MoS_2 triangle, however, the exact details of the structure and mechanism have proved difficult to fully explore.

Now, a team led by Jeff Long and Chris Chang from the University of California at Berkeley have prepared a molecular analogue of the MoS_2 active site, which itself acts as an effective hydrogen-generation catalyst. Based on their previous work in which they used a large pentapyridyl ligand to stabilize a molybdenum-oxo species, they treated a Mo(II) precursor with S_8 to form an Mo(IV) disulfide complex. X-ray crystallography revealed a triangular MoS_2 group very similar to those believed to be the active sites on the surface of solid MoS_2 catalysts.

The molybdenum–sulfur bonds were long enough to suggest single bonds, and the sulfur–sulfur bonds were similar in length to those in S_8, which suggests they are single in character too. In aqueous media at pH 3, the disulfide complex acts an electrocatalyst for the reduction of protons from water, whereas the similar oxo complex does not, demonstrating the importance of the disulfide unit. Even without further optimization, the complex's stability and turnover is in excess or comparable (respectively) to hydrogenase enzymes. *NW*

Written by Gavin Armstrong, Stuart Cantrill, Stephen Davey, Anne Pichon and Neil Withers.

blogroll

Scary chemicals

Sensational chemophobia and the problems with biofuels

'Are you scared yet?' This is the title of See Arr Oh's post on Just Like Cooking (http://go.nature.com/ULPI6e) but could equally serve as the unspoken subtitle of the news report he's blogging about. First highlighted on ChemBark (http://go.nature.com/OyD1Y8) the investigative report from US TV channel Fox29 is about "unlocked chemistry labs and the ease with which a terrorist could steal hazardous materials". So far, so serious. But, as ChemBark says, "the underlying point of securing labs is a valid one, but the presentation is way Way WAAAAAAY over the top". See Arr Oh takes the presentation to task more than ChemBark, giving us some random quotes that illustrate the chemophobic sensationalism of the report, which breathlessly reveals the presence of 0.1 M HCl and ether. He counted "26 mentions of the word 'chemical' (or once every 14.4 seconds)" – mostly "preceded by a sensationalist adjective". We can't deny that lab security is an issue for serious discussion, but perhaps it deserves better reporting than it got from Fox29.

When Nobel Laureates talk, people listen — and when they write provocative editorials, people read closely. So when we spotted the editorial in *Angewandte Chemie* by Hartmut Michel (1988 Laureate) titled 'The Nonsense of Biofuels' (http://doi.org/fz4j8d), we sat up. And so did Ash Jogalekar at The Curious Wavefunction (http://go.nature.com/WBNnYZ), where he took us through the photosynthesis expert's arguments. First among these is the lack of efficiency of photosynthesis itself — a 4% upper limit — which is exacerbated by the energy needed to grow, harvest and transform the biomass into useful fuels. Finally, when it comes to fuelling transportation, only 20% of the energy produced by a combustion engine is used to propel the vehicle. Michel suggests that either photosynthesis needs to be improved, or photovoltaics and batteries pursued with more vigour — solar cells are around 15% efficient, and vehicles can usefully use 80% of the battery's energy.