JCE Featured Molecules

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Catalysts from the 2005 Nobel Prize in Chemistry

February Featured Molecules

The 2005 Nobel Prize for Chemistry celebrated molecules that are of great value to researchers, to the broader society, and to chemical educators. The work of Chauvin, Grubbs, and Schrock, and their many collaborators, is described by Charles P. Casey (pp 192–195), and an experiment using the second generation Grubbs catalyst has been developed by Douglass Taber and Kevin Frankowski (pp 283–284).

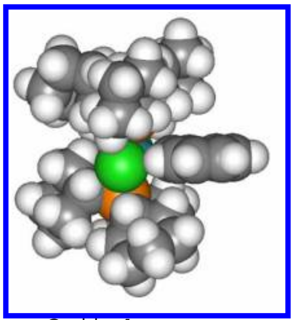
The molecules themselves serve as useful examples of the utility of 3-dimensional structures in the classroom and laboratory, and on assignments and exams. Comparison of the interactive structures of the first generation Grubbs catalyst with the structure in the Casey paper helps beginning students to develop their skills at reading chemical structure shorthand in a way that is of great value when studying reaction mechanisms, spectroscopy, or almost any other aspect of chemistry or any of the molecular sciences—size and shape do matter. The 2-dimensional form of the structure might easily give students the impression that the ruthenium is quite open in this molecule, but they quickly see that this is clearly not the case when they examine the 3-dimensional form. Students who have done this are unlikely to be surprised to learn that the catalyst is activated by dissociation of one of the tricyclohexylphosphine groups.

In introductory courses it is too often the case that the discussion of metal complexes focuses on classic Werner species (with, perhaps, some discussion of hemoglobin/myoglobin). Such complexes are indeed useful icons for introducing ideas of color, spectra, and magnetic properties arising from the lowering of the degeneracy of the d-orbitals on the metal. However, students should also be exposed to the role of metal complexes in catalysis, and the molecules for this month are excellent examples for classroom use.

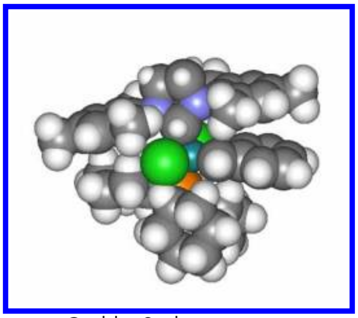
The Casey paper ends with a quote on the continuing need to support basic research. Students, whether or not they become scientists, will become taxpayer and, in some cases, decision makers. They need constantly to be reminded that individual molecules are important to our daily lives and to the functioning of society. These catalysts are useful entrees to such discussion.

Fully manipulable (Chime and Jmol) versions of these and other molecules are available at the *JCE* Digital Library Web site:

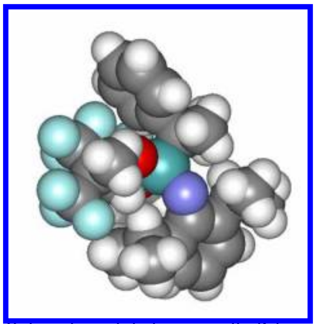
http://www.JCE.DivCHED.org/JCEWWW/Features/MonthlyMolecules/2006/Feb



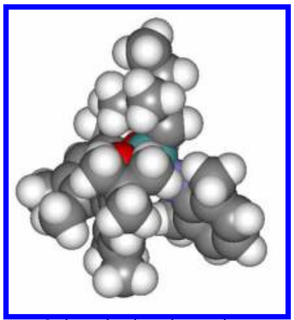
Grubbs 1st generation catalyst



Grubbs 2nd generation catalyst



Schrock molybdenum–alkylidene catalyst



Schrock chiral catalyst