

#### **478e Characterization and Kinetic Evaluation of Dendrimer-Derived Bimetallic Catalysts for the Selective Hydrogenation of 3,4-Epoxy-1-Butene**

*Dongxia Liu, John Monnier, and Christopher T. Williams*

We have been developing a new synthetic approach for heterogeneous catalysts involving the rational “atom-up” design and fabrication of dendrimer-stabilized nanoparticles immobilized on conventional catalyst supports. Hydroxyl-terminated polyamidoamine (PAMAM) dendrimers are spherical hyperbranched polymers containing repeating amine-amide branching units. They provide an ideal environment for trapping guest species, and this property can be utilized in the preparation of metal nanoparticles and supported metal catalysts. The catalyst synthesis process involves four steps: complexation of the metal ions with the dendrimer amine groups, reduction of the metal ions to obtain dendrimer-encapsulated metal nanoparticles, deposition of the metal-dendrimer nanocomposites onto an oxide support, and removal of the dendrimer “shell” by thermal treatment. Bimetallic Pt-X (X = Ru, Pd) have been synthesized via the dendrimer method following either co-complexation/co-reduction or sequential complexation/reduction protocols. These materials have been characterized by CO chemisorption, FTIR studies of probe molecules, and high resolution transmission electron microscopy (HRTEM), including energy dispersive X-ray (EDX) analysis. Furthermore, the kinetic trends have been investigated for the selective hydrogenation of 3,4-epoxy-1-butene (EpB). In several cases, the dendrimer-derived catalysts demonstrate clearly different (and in some cases enhanced) catalytic behavior compared with materials prepared from traditional wet impregnation of metal salts. The implications of these findings, as well as future directions of this research will be discussed.