Catalysis is also a foundational pillar for sustainable chemical processes; the discovery of highly active, environmentally benign catalytic processes is a central goal of Green Chemistry. The development of biomass-derived chemical and energy feedstocks is a key element of strategies to identify alternatives to our current petrochemical-based economies. The dominance of fossil fuels and the environmental impact of petroleum and coal-based economies highlight the need for alternative and more varied sources of energy and chemicals to provide the energy, materials, products and technologies that improve our lives while preserving the environment for future generations. The utilization of renewable biomass requires selective catalysts that can convert highly hydroxylated biomass feedstocks into new chemical intermediates and thermoplastics. New scientific advances in the development of selective catalysts to transform these highly functionalized feedstocks will expand the range of options for transforming biomass into useful and environmentally sustainable products. We have developed new catalytic methods for transforming biomass feedstocks into new monomers and chemical intermediates based on the chemoselective oxidation of polyols. Mechanistic and theoretical investigations generated new scientific insights on scope and limitations of these methods. Parallel developments in organocatalytic polymerization reactions have illuminated opportunities for the synthesis of well-defined macromolecular architectures from renewable feedstocks, including high molecular weight cyclic polyesters.
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