Atomically dispersed supported Metal Catalysts: synthesis, structural characterization, and catalyst performance

Abstract:
Catalysts consisting of isolated oxophilic metal atoms bonded to supports are well established in industry. Noble metals isolated on supports are now drawing intense interest—stimulated by atomic-resolution microscopy images revealing the metal atoms and spectroscopic determinations of the catalytic site structures. These catalysts have been made on oxides, zeolites, carbons, and metals. New catalysts with unique properties are being discovered rapidly. Researchers are gaining deep insights to advance the science and bolster discovery of new catalysts. Crucial to recent progress are results determined at synchrotrons, including XANES and EXAFS spectra and ambient-pressure X-ray absorption spectra.

Catalysts for prospective applications are oxide-supported cationic metals for CO oxidation and C–H bond activation, and metal-supported zerovalent metals for C–H bond activation and hydrogenations. This field is stimulating not only catalysis science but also surface science, materials synthesis, and electron microscopy.