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Preface: Catalyst preparation

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The properties of a catalyst depend on its preparation method. As catalysts are increasingly better characterized, the science of preparation also becomes more sophisticated, and there is an increasing fundamental understanding of the chemistry of the transformation of a catalyst precursor into a catalyst. As researchers strive for the goals of complete control of catalytic properties and custom-designed catalysts, there is a continuing interest to expand the knowledge of catalyst preparation. This volume is prepared with this purpose in mind. It is a collection of research reports based on 14 papers presented at the 15th North American Catalysis Society Meeting, held in Chicago, Illinois, on 18–23 May, 1997 in the sessions on New Developments in Catalyst Preparation. Preparation of metal, oxide, sulfide, nitride and carbide catalysts were included in these sessions.

The collection of manuscripts on the synthesis of supported metal catalysts represents a typical cross section of topics in the field. The primary focus of these manuscripts is on the synthesis variables and how they affect both the physical and the catalytic properties of the final materials. The role played by promoters, such as niobia, on the acid properties of $Pt/Nb_2O_3/Al_2O_3$ is discussed with reference to the selective conversion of heptanes to olefins. Co/SiO_2 catalysts, prepared by a novel evaporation technique, are presented by Backman's group. They are considered in terms of their potential as hydrogenation catalysts.

In recent years, the selective catalytic hydrogenation of edible oils has attracted considerable attention. In particular, the *cis*-configuration is favored over the *trans*-configuration as it imparts less rancidity into the partially hydrogenated product. Because a higher selectivity can be obtained using electrochemical methods at low temperatures, new catalysts for performing these hydrogenation reactions are an ongoing important area of research. A recent study by Jovanovic et al., on the use of a novel Ni hydrogenation catalyst for the selective hydrogenation of sunflower oil has been included as an example of these new catalysts.

Finally the important area of bimetallic catalysts is addressed in a paper by Margitfalvi's group. The formation of a new type of supported Sn–Pt catalysts prepared by the formation of multilayered tin organometallic surface species is presented and its characterization by a series of interesting physical techniques is discussed.

Papers on oxide catalysts cover a wide range of topics in terms of the method of preparation (sol–gel, low-temperature solution synthesis, surfactant-assisted synthesis), types of materials (mixed oxides, ammonium mixed-metal molybdates, pillar clays), and properties (acidity, basicity, oxidation catalysis). In particular, a paper by Miller and Ko discusses the effect of dopants such as silica and phosphate on the

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structural and textural evolution of alumina aerogels. In the paper by Dominguez et al., a new family of precursors containing Al, Ga, Ln, and Zr are used to prepare pillared clays that are thermally stable. Successful formation of a high surface-area, fluorite-structure ceria-zirconia sample from a surfactant-assisted route is demonstrated in the paper by Terribile et al. The study of Alcaraz et al., on a supported solid base catalysts, sheds light on both its catalytic performance in mercaptan oxidation and the accompanying deactivation mechanism. The paper of Bueno et al. also addresses catalytic oxidation, in this case the selective oxidation of butane over silica-supported VPO catalysts. Despite their diversity, together these papers highlight a central theme, namely the importance of understanding catalyst preparation at a sufficiently fundamental level so that its relation to eventual catalytic behavior can be firmly established.

Market and environmental challenges are increasing the demand for improved catalysts and processes for the removal of sulfur, nitrogen and other heteroatoms from crude oils. While sulfides remain the most widely used hydrotreating catalysts, new highly active formulations have been reported. The papers on these topics describe the preparation and properties of molybdenum sulfide-based catalysts with improved activities and selectivities. In the papers by Labruyère et al., Alonso et al., and Ramirez et al., different methods to prepare sulfide catalysts and the characterization results are reported. In the paper by Chen, the electronic and catalytic properties of early transition metal nitrides and carbides, a new class of hydrotreating catalysts is discussed. The results illustrate that new materials and synthetic methods continue to yield catalysts with enhanced activities, selectivities and durabilities.