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Preface

This special issue of *Catalysis Today* is devoted to full papers derived from presentations at the "Catalysis on Metals" session at the 16th North American Meeting of the Catalysis Society, Boston, May 30–June 4, 1999. Catalysis by metals is found in the earliest examples of catalysis, such as Sir Humphry Davy's discovery in 1817 that the introduction of hot platinum into a mixture of coal gas and air led to the metal becoming white hot. Metal-catalyzed reactions — hydrogenation–deydrogenation, aromatization, isomerization, dehydrocyclization, hydroformylation, oxidation, reductive decomposition — form the basis of a wide range of industrially important processes in hydrocarbon chemical processing/value-added and in emissions control. The contributions in this volume chiefly comprise efforts toward increased understanding of structure-function at the catalytic surface.

The contribution from Tysoe and co-workers provides a comprehensive description of the mechanism of cyclotrimerization of acetylene to benzene on Pd–surfaces. Discussion of the associated surface reactions illustrates how such strategies can be used to understand catalytic reactions in detail. In their study of accelerated coking, Paál and co-workers have demonstrated several different kinds of carbon in coking at the Pt surface, not all of which affect activity and selectivity. Correlations are indicated between the amount and chemical state of surface carbon and its deactivating effect. Gao, Tan and Baker present a study of an alternative heterogeneous route for ethylene hydroformylation, catalyzed by Rh supported on various morphologies of graphite nanofibers, which has yielded valuable insight into the effect of the support on the selectivity of this reaction. It appears that the nanofibers function as a template for the metal particles, which in turn acquire crystallographic characteristics that are not generally encountered with other less ordered support materials. The paper by Auer, Gross, Panster and Takemoto discusses a new modified iridium catalyst for the industrially important reaction of selective hydrogenation of dinitrotoluene to toluenediamine in liquid phase. In comparison with the industrial standard, Pd/C or Pd–Fe/C catalysts, the iridium-based catalysts give substantially lower tar formation and other side products.

The first four papers are followed by five contributions dealing with the effect of catalyst preparation on selectivity and activity. The novelty of the contribution by Chandler and Pignolet is the preparation of bimetallic samples using a complex containing Pt and a Group IB metal. While the spectroscopic results suggest the formation of unique alloys, differences in catalytic activities and selectivities are concluded to owe primarily to geometric, that is, structural or morphological effects. The study of CO hydrogenation and methane activation by Guczi and co-workers is focused on the interaction between Pd and Co in bimetallic Pd–Co/SiO_2 catalysts. In contrast to other Pd–Co systems, bimetallic particles were not formed. The reducibility of cobalt is limited and is confined to the surface. These effects appear to be a consequence of the small particle size deriving from the method of preparation. Shao and Song's investigations of regioselective hydrogenation, motivated by the need to produce effective hydrogen donors in high-temperature fuel stabilizers, show that, on appropriately-chosen supports, bimetallic Pd, Pt species comprise effective low temperature, selective hydrogenation catalysts. Mul and Hirschon discuss optimum preparation procedures for Pd/lanthana catalysts, which are known to be effective for methanol decomposition. It is shown how the preparation procedure can strongly affect the methanol decomposition activity. An overall message of the paper by Monteiro,

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Dieguez and Schmal is that different precursors can control different Pd particle morphology, which, in turn, have been identified and correlated with catalytic activity.

The editor wishes to thank all of the contributors to this special issue of *Catalysis Today* and also to express his appreciation for the encouragement and assistance of Dr. James J. (Jerry) Spivey, Associate Editor. We hope that readers will benefit from these internationally drawn efforts.

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