Preface

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Metal oxides play a central role in applications of heterogeneous catalysis, serving as an active phase, a storage material or a support for metallic nanoclusters. Advancing the fundamental understanding of oxide surface chemistry is of great importance for describing and predicting the performance of oxide catalysts and developing rational strategies for catalyst design.

This special issue of *Topics in Catalysis* titled, “Surface Chemistry of Well-Characterized Metal Oxides”, features original research articles discussing structural and chemical properties of metal oxide surfaces. These articles show that significant advances in fundamental understanding are being made through the use of both state-of-the-art experimental and computational methods. Researchers have increasingly shown that thin oxide films grown on metallic substrates can serve as representative model systems of well-defined oxide surfaces, thereby enabling a wide-array of surface analytical methods to be applied in characterizing the physical and chemical properties of metal oxide surfaces. Studies of oxide films have

furthermore shown that ultrathin oxide nanostructures can exhibit novel structural and chemical properties, potentially providing opportunities for tailoring the catalytic properties of oxides. The articles in this volume emphasize the strong dependence of the surface reactivity on the surface structure of metal oxides, and clarify the role of local structures (e.g., defects, exposed facets) as well as nanoscale structure in promoting the binding and chemical reactions of adsorbed species. These studies indeed reveal the importance of performing detailed structural characterization to aid in establishing fundamental structure–reactivity relationships of metal oxide surfaces. Several articles also demonstrate how advances in computational modeling are providing an in-depth understanding of oxide surface chemistry. The articles included herein show how careful experimental and computational studies are providing new insights for understanding the structures and surface chemistry of metal oxides at the atomic level as well as raising new questions about these fascinating and technologically important materials.

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