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Catalysis Today 49 (1999) 337



## Preface

# New applications of spectroscopy in catalysis

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Spectroscopy has always played a critical role in the elucidation of catalyst structure and behavior. However, the rapid pace of technological development in the fields of optics, electronics, and material sciences has provided the scientist with ready access to equipment, utilizing increasingly better optics, higher magnetic fields, and more sensitive detectors, all tied to increasingly faster computers for complex data acquisition and manipulation. As scientists studying catalysis have gained access to these improvements, new spectroscopic methodologies which allow scientists to study catalytic reactions at the molecular level under conditions that increasingly reflect normal catalytic operating conditions have been evolving at an astounding pace.

Often these advances have outpaced the normal exchange of ideas and concepts within the scientific community. Discussions with a number of our colleagues in industry and academia indicated that it would benefit the entire catalyst community especially those involved in the spectroscopic investigation of structure/activity relationships to convene at a common location to facilitate the exchange of ideas, concepts, and new methodologies. We (the guest editors) were joined by Prof. James Haw (University of Southern California, Pasadena, CA) and Prof. William Moser (Worcester Polytechnic Institute, Worcester, MA), who shared this view, and as a group, organized a symposium entitled, "New Applications of Spectroscopy in Catalysis". This symposium which was held at the Spring, 1998, American Chemical Society Meeting in Dallas, TX (USA) over a period of three

days, consisted of over 30 presentations by a number of leading international scientists in the field.

The symposium represented the newest advances in nuclear magnetic resonance and electromagnetic spectroscopies as applied to both homogeneous and heterogeneous catalysis with both spectroscopic technologies being represented in roughly even proportions.

This issue represents a selection of papers presented at the symposium. From an organizational perspective, they have been divided into applications of nuclear magnetic resonance spectroscopy and applications of electromagnetic spectroscopy (IR, UV-Vis, and X-ray). These papers feature:

1. descriptions of recently developed techniques for studying catalytic reactions in situ; this includes new methods for studying solid-state catalysts by nuclear magnetic resonance spectroscopy and a detailed description of the internal reflectance technique,
2. applications of new techniques in the identification of key intermediates in catalysis and elucidation of the key structural and chemical changes occurring during the course of the catalytic process, and
3. in a few cases, the application of existing techniques to novel problems in catalysis.

Hopefully this issue will serve to highlight some of the key developments occurring in spectroscopic applications for the study of catalysis and promote further evolution in this area.