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Introductory Comments of Guest Editor

This special edition of *Thermochimica Acta* was not born out of a meeting or workshop, as is often the case, but rather in response to the recognition by the editors that calorimetry is increasingly important as a tool for catalyst and surface characterization. It was also recognized that there is, at present, no single source of information on the use of calorimetry in catalysis. Thus, the goal assigned this editor was to design an issue which would be of value to the debutante in the area. To be truly valuable to such an audience, it is clear the issue should be composed of contributions from leaders in the field which contain new scientific insights from a range of applications, scholarly reviews of past work, detailed insight into the latest equipment designs and some vision regarding future directions. Hopefully, readers will find that this issue contains all of those elements.

Scientists unfamiliar with the field may be surprised by the breadth of issues that can be tackled using adsorption calorimetry. Topics range from the most fundamental chemistry to the most applied. Examples of the former, some of which are outlined by Professor S. Cerny, are new techniques which allow the adsorption of gas atoms on specific single-crystal planes to be measured differentially with great sensitivity. Information of this type is invaluable for testing quantum mechanical models of adsorption, as well as in determining rate constants to be used in detailed models of surface kinetics.

There are many contributions in this issue focused on the use of microcalorimeters for characterizing the active sites on solid acid catalysts. This reflects the fact that, at present, the study of acid catalysts is the most active field of surface calorimetry. Microcalorimetry is generally regarded as the best technique for probing the sites on this industrially important class of catalysts. One theme in many studies of acid catalysts found here, for example in the contribution of Professor H. Kung, is an old one: In what fashion are the measured heats a reflection of the kinetics, rather than the thermodynamics (equilibrium) of adsorption? Also related to the problem of deconvoluting the impact of various effects on the measured heats is the model developed by Dr. A. Auroux to distinguish heats of chemical adsorption from those of physical adsorption. A second theme, probably a reflection of the first, found in works on this topic, is the need to employ complementary techniques in the study of acid catalysts. For example, professors J. Jänchen and N. Cardona-Martinez, as well as Professor V. Bolis, all use infrared spectroscopy to strengthen their understanding of the calorimetric probes of acid sites.

Another topic, covered in the work of Dr. A. Menendez-Diaz, as well as the contribution of the editor, is the use of calorimetry to probe high surface-area carbons. These materials are not only valuable as adsorbents, but increasingly as catalyst supports, and even as catalysts. Finally, there are a number of contributions on the use of calorimeters to study adsorption on supported metal-catalyst particles (professors J.A. Dumesic and T.A. King, and Dr. J.M. Guil). Studies of this type can be used to determine fundamental information such as adsorption heats (even rates). It is also clear that calorimetry is the most powerful probe of the composition of the outer-layer surface of multimetallic particles. Indeed, calorimetry is the most powerful tool for determination of the composition of the outermost layer of multimetallic particles.

The true beginner can also gain insight into the construction of calorimeters. The truly ambitious surface scientist can use Professor Cerny's article as a guide to the construction of a system for measuring adsorption heats on single-crystal surfaces. Those

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excited about the construction of a calorimeter for probing powders of all types can review the articles by the editor (Jonathan Phillips) or those by professors J.A. Dumesic or R. Gorte. A number of commercial calorimeters are described, including a flow calorimeter of the type often used to measure adsorption from the liquid onto a solid surface, by Dr. A. Grozeck.

I want to thank the editors of *Thermochimica Acta*, particularly Dr. Larry Whiting, for allowing me this opportunity to serve the community in a fashion I find to be meaningful, and I want to thank all of the authors and reviewers for the time and energy they put into this project.

Finally, I must extend special thanks to Dr. Aline Auroux for her encouragement and invaluable assistance in this effort.

Jonathan Phillips
Guest Editor, *Thermochimica Acta*
Professor of Chemical Engineering
The Pennsylvania State University
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