



Catalyst Design Across Reaction Conditions: A Special Issue in Honor of Prof. Cynthia Friend

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There were two important symposia during the ACS Spring 2017 Meeting. The first one was on the topic of “Designed Catalysis: Materials Genome Approach to Heterogeneous Catalyst” covering the state of the art effort towards materials genomic approach to designing heterogeneous catalysts. The second one was in honor of Prof. Cynthia Friend for receiving the ACS Award in Surface Chemistry. This special issue is based largely on the work of leaders in heterogeneous catalysis who together provided a message in these two symposia about the need and ability to link fundamental understanding to catalyst design. Needless to say, Cynthia has been a key contributor and a leading scientist in this effort, especially in bringing together the fields of surface science and catalysis. The symposia presenters, therefore, have come together to bring this special issue, sharing some of the pioneering research from their laboratories in order to celebrate her successes. This special issue covers a wide range of catalyst surfaces and reactions, spanning single crystal catalysis under controlled conditions to catalysts under catalytic conditions.

The pioneering research of Prof. Friend concerns with one fundamental question: How can we utilize the knowledge gained from fundamental studies of mechanism on well defined surfaces to design catalysts for operational conditions?? This line of inquiry encompasses critically important issues for the chemical industry and addresses the challenge of applying surface chemistry to tackling more real-world problems at ambient pressures. She has demonstrated well the ability to discover the mechanistic aspects of surface reactions at surfaces on an atomic and molecular scale. Prof. Donna Chen of University of South Carolina, one of her former students, says of her, “Cyndy’s research has led to critical insights into the mechanisms of oxygen-assisted coupling reactions on the coinage metals and their alloys.

By establishing common mechanisms for reaction on single-crystal Au surfaces and nanoporous Au catalysts, her work has bridged the gap between fundamental surface science and heterogeneous catalysis under realistic conditions. Furthermore, Cyndy has been a fantastic mentor to her graduate students and postdocs; she taught us how to think critically and solve problems, as well as the value of rigorously controlled experiments. She is also a wonderful role model for women in science, both leading by example and providing valuable advice to young female scientists.”

Cynthia has published over 300 papers, many highly cited, that have had significant impact in catalysis and chemistry. Her publication in ACS Chemical Reviews entitled “Heterogeneous Gold-Based Catalysis for Green Chemistry: Low-Temperature CO Oxidation and Propene Oxidation.” This article appeared in 2007 and has up to now been cited over 500 times. The intense interest in this paper is a testimony for her path breaking discoveries in gold catalysis. Prof. Graham Hutchings says, “Cynthia’s work on gold catalysis has provided new insights into how these fascinating catalysts work and can give high specificity using a wise choice of techniques.” Prof. Robert Madix notes “Cyndy is an inspiration. Her insight into surface reactivity and her chemical intuition via her background in organometallic chemistry are unsurpassed in the field of surface chemistry.”

Cynthia has contributed in many significant ways to the catalysis and chemistry communities. She has played an important role in setting the national scientific agenda through her leadership of the 2017 DOE Basic Research Needs Report on Innovations in instrumentation and the 2011 NSF catalysis workshop and participation in many other national advisory panels and workshops (<https://science.energy.gov/bes/efrc/research/bes-reports>). She is also currently the Director of Rowland Institute at Harvard that develops the careers of early career independent scientists and of the Harvard EFRC in Sustainable Catalysis (IMASC) (<https://efrc.harvard.edu>). Friend has also previously served as Associate Lab Director at Stanford’s SLAC, Associate

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Dean at Harvard and Chair of the Dept. of Chemistry and Chemical Biology at Harvard. In addition, she has been a Senior Editor at Accounts of Chemical Research (ACS) and Editor-in-Chief of Catalysis Science and Technology (RSC) and a member of several editorial boards. Her scientific achievements have been recognized by many awards and honors among which are the first female full professor in the Department of Chemistry and Chemical Biology at Harvard University, the Alexander von Humboldt Senior Research Award, the Langmuir Lectureship, and the Garvan Medal, the George C. Olah Award and the Surface Chemistry Award from the American Chemical Society. She is a Fellow of the ACS as well.

This special issue recognizes the central importance of heterogeneous catalysis today, the excellent work of all of the contributors to this issue, and the contributions of Prof. Friend. As the editor of the issue, I am grateful to all the contributors, reviewers and the publishers in ensuring production of a timely and quality publication worthy of dedication to Cynthia, celebrating her contribution to catalysis in general and in particular for her receiving the ACS award for Surface Chemistry. It was a privilege and a pleasure to organize these two special symposia and to serve as guest editor for this special issue of *Topics in Catalysis*.