NMR and the Grand Challenges of Metal-Organic Frameworks

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Abstract:

Metal-organic frameworks (MOFs) are a new class of inorganic framework materials that exhibit a wide variety of physical and chemical properties. MOFs are particularly interesting owing to the ability to systematically vary metal composition and framework ligands so as to create a universe of different materials by design. MOFs then become near-ideal platforms for understanding interfacial phenomena and catalysis since key variables, such as framework structure, chemistry and pore size, can all be tuned independently. Technological applications of MOFs have subsequently flourished in recent years. Several grand challenges remain, however, in understanding these compelling materials. Each of these grand challenges poses technical hurdles for analytical and structure-determination methods, yet nuclear magnetic resonance (NMR) spectroscopy has, in principle, the ability to address them all. In my lecture I will summarize previous and new research from my lab that uses NMR access points to address diffusion, reaction, defects, and structure within this fascinating class of materials.

Biography:

Dr. Jeffrey A Reimer received his BS from the University of California at Santa Barbara. He obtained his doctorate in chemical physics from the California Institute of Technology while working with physicists from Xerox PARC examining the chemistry and the physics of solar cell materials. Prior to his appointment at Berkeley, he conducted basic and applied research in semiconductor science and technology as a postdoctoral fellow at IBM Research in Yorktown Heights, New York.

Reimer was an Associate Dean of the Graduate School at Berkeley from 2000-2005 He was Chair of Berkeley's Department of Chemical and Biomolecular Engineering from 2006-2011, and from 2013 to present. He has served as the chair of the Academic Senate subcommittee on GSI affairs, Finally, he serves as a member of the Board of Trustees for Franklin University Switzerland and served as the Chair of the Governing Board for the Council for Chemical Research in 2015.

On campus, he has won many awards including the UC Berkeley Distinguished Teaching Award in 2003, the highest award bestowed on faculty for their teaching. His introductory textbook (*Chemical Engineering Design and Analysis – an Introduction* co-authored with T. Michael Duncan), focuses on teaching chemical engineers about the importance of design concepts early in their academic studies. Reimer's most recent scholarly works span a range of materials studies, including the structure and proprieties of metal organic frameworks for carbon capture and electrical and optical control of nuclear polarization in semiconductors. He is author or co-author of ~210 research publications. In addition to his research publications, Professor Reimer is co-author (with T.M. Duncan) of the introductory text *Chemical Engineering Design and Analysis* (Cambridge University Press, 2nd edition, 2019), and the text *Carbon Capture and Sequestration* (with Berend Smit, Curt Oldenburg, Ian Bourg, World Scientific Press, 2013).

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