

UniSysCat - Colloquium

Prof. Fanxing Li

North Carolina State University

Start Time: Wednesday, November 2, 2022 05:15 pm

End Time: Wednesday, November 2, 2022 06:30 pm

Mixed Oxides as Multi-Functional Reaction Media for Chemical Looping Catalysis

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Mixed metal oxides containing first row transition metals encompass large families of materials, many of which offer unique properties for energy and chemical conversion. This presentation seeks to illustrate potential approaches to tailor the defect structures and redox properties of mixed oxides for process intensification via chemical looping catalysis. Specifically, large numbers of Fe and Mn containing perovskite oxides are investigated, via high throughput computational screening approaches, to arrive at oxides with distinct redox properties covering large ranges of equilibrium oxygen partial pressures (10^{-20} – 1 atm) and temperatures (400 – 950°C). Further tailoring the surface properties of these mixed oxides offers the opportunity for various catalytic applications to intensify chemical production. Using oxidative dehydrogenation (ODH) of ethane as an example, the underlying mechanism and design principles for the mixed oxide based redox catalysts will be illustrated. Compared to traditional heterogeneous catalysts, the redox catalysts show the potential to be significantly more selective. Moreover, the resulted process scheme, which integrates chemical reaction with separation, can be substantially more efficient with near order of magnitude emission reduction when compared to state-of-the-art. Besides ethane ODH, a number of other applications such as redox oxidative cracking of naphtha, oxidative coupling of methane, ODH of butane and alkylbenzenes, and other emerging topics of chemical looping catalysis will also be discussed.

Bio

Dr. Fanxing Li is an Alcoa Professor in the Chemical and Biomolecular Engineering Department at North Carolina State University. Dr. Li received his BS and MS degrees in chemical

engineering from Tsinghua University in 2001 and 2004, respectively. He received his PhD at the Ohio State University in 2009. He has won numerous awards including the “20 under 40” by the American Society for Engineering Education, the U.S. National Science Foundation CAREER Award, Humboldt Fellowship for Experienced Researchers, SABIC Young Professional Award, the NC State Sigma Xi Faculty Research Award, and was named as a NC State University Faculty Scholar and a winner of the Chancellor’s Innovation Fund.

Prof. Dr. Reinhard Schomäcker

Organizer