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Wednesday, April 22, 2026 @ Princeton
35 Ivy Lane, Princeton, NJ 08540 (Room: F212 SEAS-CBE)

***A special lecture from the 2026 NYCS Excellence in
Catalysis Awardee***



Prof. Lars Grabow

*Department of Chemical and Biomolecular Engineering and Texas Center for
Superconductivity, University of Houston
Center for Programmable Energy Catalysis (CPEC), University of Minnesota*

From Water to Waveforms: Programming the Catalyst Environment

This lecture will highlight my group's efforts to improve catalytic performance not by changing catalyst composition, but by engineering the catalyst's working environment. A central theme is that the local environment at metal-support interfaces can directly control elementary reaction steps. In Au/TiO₂, we showed that water and surface hydroxyls promote O₂ activation during CO oxidation by supplying protons, while inhibiting heterolytic H₂ activation by altering charge transfer across the interface. On Ru/TiO₂, water likewise tunes selectivity during hydrodeoxygenation of phenolic compounds by modifying the acid/base character of interfacial sites involved in C–O bond cleavage. More recently, we have extended these ideas to hydrogen spillover, showing that it can be entropy-driven and proceed through proton-coupled electron transfer. Together, these studies point to a broader mechanistic framework in which the catalyst environment, rather than catalyst composition alone, determines reactivity.

Building on these insights, we are now investigating how catalytic performance can be improved through dynamic operation and programmable external stimuli. Using detailed kinetic and reactor models, we show that forced oscillations in feed composition can transiently create optimal surface conditions, suppress poisoning, and enhance rate or selectivity beyond steady-state limits. In parallel, catalytic condensers offer a route to periodically modulate catalyst electron density and surface binding energies, potentially relaxing the traditional Sabatier constraint. Light provides a further handle for controlling catalyst function, for example, photon-driven CO desorption on Pt catalysts provides a handle to limit CO poisoning through photonic stimulation. Overall, the talk presents a broader view of catalyst optimization in which the chemical, electrical, photonic, and temporal environment of a catalyst can be deliberately programmed to achieve maximum performance.

Speaker Bio

Prof. Lars Grabow is the Dan Luss Professor in the William A. Brookshire Department of Chemical and Biomolecular Engineering at the University of Houston. He received his PhD in Chemical Engineering from the University of Wisconsin in 2008, followed by postdoctoral appointments at the Technical University of Denmark and Stanford University. His expertise is the application of electronic structure calculations, kinetic modeling, data science and transient kinetic characterization to problems in heterogeneous and photo-/electrocatalysis, surface science, and energy transition. His papers have been cited more than 10,300 times (Google Scholar). Dr. Grabow was elected into the 2018 Class of Influential Researchers by *Industrial and Engineering Chemistry (IE&C) Research*, won the prestigious U.S. Department of Energy (DOE) Early Career Award (2014), and the NSF CAREER Award (2015), and most recently, the Excellence in Catalysis Award from the New York Catalysis Society (NYCS, 2026). He currently serves as Editor-in-Chief of *ChemistryEurope*, and was previously Editor of *Surface Science*.

<u>Schedule</u>		<u>Meeting Fees</u>	
Drinks/networking	6:00 PM	Non-members	\$50
Dinner	6:30 PM	Students	\$25 (Student Members = \$10)
Award + Seminar	7:30 PM	Retired/Post-Doc/Unemp.	\$40 (Members = \$30)
Q&A	8:20 PM	<i>Annual Membership Dues</i>	\$35 (Students = \$15)
Closing remarks	8:30 PM		

There will be no student speaker this meeting.

Deadline for reservations is 5:00PM Wednesday, April 15, 2026

Please RSVP online using the [online form](#).
To renew your membership, please visit this [link](#).