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ONE-DIMENSIONAL BIMETALLIC ARCHITECTURES AS MULTIFUNCTIONAL ELECTROCATALYSTS IN ALKALINE AND ACID CONDITIONS

Speaker: **Christopher Koenigsmann, Ph.D.**

Associate Professor of Chemistry,
Fordham University

Date: **Wednesday, March 12, 2025**

Time: Coffee Hour: 5:30 pm
Speaker: 6:00 pm

Place: Westchester Community College
75 Grasslands Road
Valhalla, NY 10595
Gateway Center, Room 110

ZOOM: This meeting will also be available online via ZOOM
ZOOM link to be provided in the March Indicator

Event is free of charge

Please contact Peter Corfield at pcorfield@fordham.edu to RSVP for the meeting or if you have any questions.

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Abstract:

Development of practical electrocatalysts for fuel cells, electrochemical sensors, and batteries requires nanostructured architectures with high catalytic activity and good long-term durability. It is also essential that they have very low or even no platinum content. There has also been a recent emphasis on designing multifunctional catalysts with the ability to efficiently catalyze a wide-range of electrochemical reactions in both acidic and alkaline media. In light of these requirements, we have developed a solution-based synthetic method to prepare bimetallic PtAu nanowires and PtCo nanotubes. The alloy motif enables a substantial quantity of platinum to be removed from the catalyst, while also resulting in the ability to tune the activity of platinum through electronic and structural interactions between the two metals. In the case of PtAu nanowires, we employ a combinatorial approach combining electrochemical measurements with Monte Carlo simulations to explore the impact of Pt-Pt and Pt-Au pair sites on the mechanism of small organic molecule (SOM) oxidation. Our results suggest that Pt-Au pair sites play more significant role in SOM oxidation than previous thought and can facilitate non-CO oxidation pathways in the oxidation of methanol and glucose. More recently, we have synthesized PtCo nanotubes with a complex surface structure that brings together metal oxide and precious metal active sites that are highly active toward the oxygen evolution reaction (OER). Using an electrochemical process, we can selectively remove the metal oxide from the surface of the nanotube, which activates the catalyst toward SOM oxidation in acidic media and OER in alkaline media. For example, the activated core-shell nanowires display a 1.5-fold and a 4-fold increase in the specific activity and

Biography:

Christopher Koenigsmann completed a Ph.D. from Stony Brook University under the mentorship of Professor Stanislaus S. Wong. He completed postdoctoral studies at Yale University in the Department of Chemistry and the Energy Sciences Institute with Professor Charles A. Schmuttenmaer. Currently, he is an Associate Professor of Chemistry at Fordham University and is the Director of the Undergraduate Teaching Assistant and Tutor Program. His research group's interests focus on the synthesis and development of functional nanomaterial architectures that are designed to increase the performance and cost-effectiveness of renewable energy, sensor, and air purification devices.

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