SPECIAL SEMINAR



Professor David Eisenberg

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Technion - Israel Institute of Technology

"Beyond the Active Site: Adventures in Nitrogen Cycle Catalysis"

Storing energy in the nitrogen cycle is a promising, yet thorny route towards energy sustainability. Featuring a broad range of oxidation states, and multiple stable intermediates, the nitrogen cycle is a rich and daunting challenge for electro- and plasma catalysis. Our group studies the oxidation of nitrogen-based fuels (hydrazine, urea and ammonia), their formation from nitrate, nitrite or N_2, and the complex reactions of N-cycle intermediates (hydroxylamine and NO_x). We focus on electrochemical mechanisms and, recently, on plasma catalysis. Our goal is to shift from active-site-oriented thinking, to a broader view of catalysis, where second-sphere coordination, local microstructure, and pore confinement are as important – or more – than the structure of the active site.

(1) Offen-Polak, Eisenberg, *et al*. A Biomimetic Twisting Strategy Enables Efficient Electrocatalytic Oxidation of Energy-Dense Hydrazine Hydrate on $FeN_{2+2}C_{4+4}$ Sites. *J. Am. Chem. Soc.* **2025**, *147* (35), 31731–31740.

(2) Farber, Eisenberg, *et al*. Porous Materials: The Next Frontier in Energy Technologies. *Science* **2025**, *390* (6772), eadn9391.

(3) Ojha, Eisenberg, *et al*. A Multi-Doped Electrocatalyst for Efficient Hydrazine Oxidation. *Angew. Chem. Int. Ed.* **2018**, *57* (52), 17168–17172.

PURDUE UNIVERSITY | James Tarpo Jr. and Margaret Tarpo Department of Chemistry

Monday, November 2, 2026 | 1:30 PM | BRWN 4102