

# Peroxide-Selective Oxygen Reduction Reaction Using Trivalent Rare-Earth Metals And Tackling Grade Inflation in Higher Education

## Seminar

Monday  
Mar. 23, 2026

3:00–4:00 p.m.

Beaupre Center,  
Room 105



The two-electron reduction of molecular oxygen ( $O_2$ ) to peroxide ( $O_2^{2-}$ ) or hydrogen peroxide ( $H_2O_2$ ) is vital for various sustainable energy technologies. Many homogeneous transition-metal catalysts have been designed to selectively reduce  $O_2$  to  $O_2^{2-}$  by controlling these multi-e/ $H^*$  transfer reactions. These catalysts can also over-reduce  $O_2^{2-}$  through Fenton chemistry or by facilitating additional e- transfer reactions, due to the potential for traversing multiple redox states in transition metals and cleave the O-O bond. Rare-earth metals have been known to stabilize reduced oxygen fragments ( $O^{2-}$ ,  $O_2^{2-}$ ,  $O^{2-}$ ) in organic media. Karlin, Fukuzumi and co-workers shifted a water-selective  $O_2$  reduction reaction to peroxide-selective by substituting Bronsted acid for scandium ion ( $Sc^{3+}$ ), forming a stable Sc-peroxide as the sole product. We envisioned a similar approach in designing peroxide-selective reactions where the rare-earth metal could both facilitate electron transfer and stabilize the peroxide product without the need for a transition metal catalyst. The first part of this seminar describes rare-earth mediated peroxide-selective  $O_2$  reactions with near-quantitative  $O_2^{2-}$  selectivity, including kinetic and mechanistic analyses.

In the second part of this seminar, we'll discuss the ongoing national debate on grading inflation. Currently over 60% of all college grades awarded in the U.S. are A's, up from about 25% two decades ago. We'll summarize the impact of this remarkable increase, and how colleges across the U.S., including Harvard, are attempting to combat it.

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