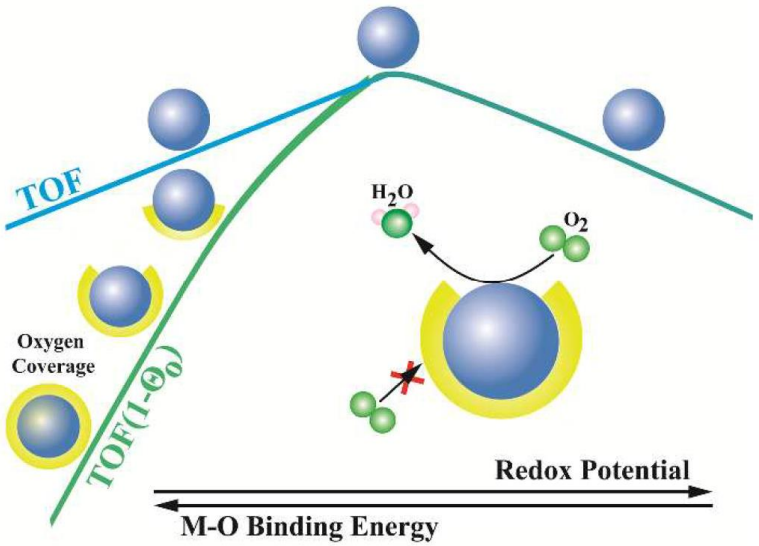
Accelerating the Oxygen-Reduction Reaction for Improved Fuel Cells and Metal-Air Batteries



The turnover frequency (TOF) of Oxygen-Reduction Reaction (ORR) catalysts was shown to be limited by the blockage of active sites by reaction intermediates for those catalysts that have low redox potentials.

J. Li, A. Alsudairi, Z.-F. Ma, S. Mukerjee, Q. Jia. Asymmetric Volcano Trend in Oxygen Reduction Activity of Pt and non-Pt Catalysts: In Situ Identification of the Site-Blocking Effect. *J. Am. Chem. Soc.* **139** (4), 1384–1387 (2017)

Work was performed at Northeastern University, Argonne National Laboratory, and Brookhaven National Laboratory

Scientific Achievement

Oxygen-Reduction Reaction catalysts with low redox potentials were found to be limited by the blockage of their active sites by reaction intermediates.

Significance and Impact

Accelerating the Oxygen-Reduction Reaction will improve the effectiveness of energy storage devices such as fuel cells and metal-air batteries.

Research Details

- Electrochemical measurements were performed in conjunction with in situ X-ray absorption spectroscopy for various Pt- and non-Pt catalysts at APS beamline 10-ID and NSLS-II Beamline 8-ID (ISS).
- Redox transition behavior was directly observed by capturing the transition from Fe^{3+} to Fe^{2+} associated with the removal of OH* as a function of catalyst makeup and redox potential.
- ORR catalysts with overly high redox potentials were limited by their intrinsic activity whereas those with low redox potential can be limited by active-site blocking.