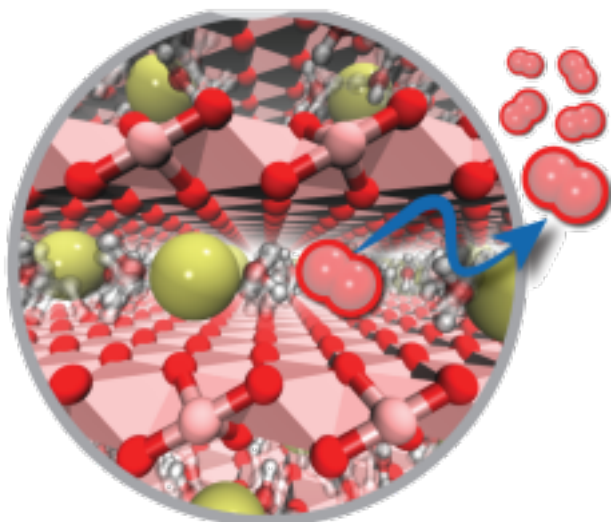


# Nickel Confined in the Interlayer Region of Birnessite: an Active Electrocatalyst for Water Oxidation



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Work was performed at Temple University

## Scientific Achievement

Intercalation of the active oxygen evolution reaction (OER) electrocatalyst, nickel hydroxide, into the interlayer region of the layered manganese oxide, birnessite, leads to a remarkable enhancement of its OER activity.

## Significance and Impact

Utilization of the unique interlayer water environment of birnessite by intercalating Ni-hydroxide into the interlayer region has led to improved OER catalysis. Combination of experimental results and molecular dynamics simulations show that improved OER activity is partially due to an enhancement of the electrostatic potential fluctuations of confined water molecules that increases electron transfer rates.

## Research Details

- Nickel hydroxide intercalation into the birnessite structure can be performed using a simple ion exchange reaction, where nickel hydrazine complex acts as a shuttle to transport nickel efficiently.
- Electrochemical investigation reveals that Nickel intercalated birnessite results in a better oxygen evolution catalyst than either of the two materials alone.
- Detailed molecular dynamics simulation suggests that intercalated nickel hydroxide catalyst in the presence of frustrated water, which results from spatial confinement in the unique environment of the interlayer, leads to enhanced electron transfer pathways that facilitate the OER.



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