

# Engineering the Composition/Crystallinity of Molybdenum Sulfide for High-performance Electrocatalytic HER

## Scientific Achievement

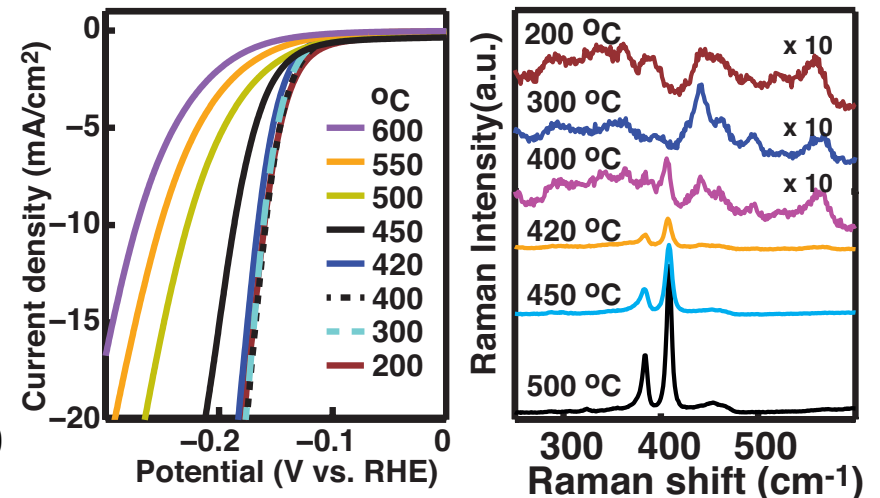
Established an unambiguous correlation between the catalytic performance of molybdenum sulfide for hydrogen evolution and its composition/crystallinity.

## Significance and Impact

Indicating that the key issue for the development of high-performance molybdenum sulfide HER catalyst is to engineer the crystalline structure such balancing the contradictory effects of crystallinity on the different aspects of the catalytic performance.

## Research Details

- The crystallinity of molybdenum sulfide plays an important role in the catalytic performance but the composition (Mo:S) does not matter much.
- The crystallinity can impact the three aspects of catalytic performance (Tafel slope, TOF, and stability) in opposite directions.
- Fewlayer MoS<sub>2</sub> nanoclusters in lateral size of 5-30 nm can provide the best balance among the contradictory effects of the crystallinity on the different aspects.



Polarization curves (Left) and Raman spectra (Right) of the molybdenum sulfide materials grown at different temperatures.

Work was performed at North Carolina State University

Yanpeng Li, Yifei Yu, Yufeng Huang, Robert A. Nielsen, William A. Goddard III, Yao Li, Linyou Cao, ACS Catalysis, DOI: 10.1021/cs501635v, 2014