

literature reading and analysis:
Chorkendorff et al. *Science*, 2007, 317, 100-102.

1. What is the general scientific question that motivates the study?

The difficulty of identifying the active site on a catalyst surface

2. What is the specific scientific question the study wants to address?

Determine the active site of nanoparticulate MoS₂ for the hydrogen evolution reaction.

3. Which experiments did the authors carry out to answer the questions?

(a) sample preparation:

$\text{Mo} + \text{H}_2\text{S} \longrightarrow \text{MoS}_2$ deposition in vacuum and then annealing

On clean gold substrate; the procedure makes a monolayer Mo_2S nanocrystals that can be studied by STM.

Annealing changes the amount of edge sites.

(b) sample characterization:

STM. The morphology of nanocrystals can be observed. The amount of surface coverage and edge lengths can be determined.

(3) electrochemical measurement.

Polarization curve (current-potential relation); Tafel plot – exchange current density and Tafel slope determined.

4. What are the key data obtained? What conclusion do they lead to?

HER activity correlates with edge length. MoS_2 crystals have promising HER activity.

The edge site is the active site for HER catalyzed by MoS_2 .

MoS_2 is a promising materials for catalyzing HER.

(5) Do you think the experiments are valid? The interpretation of data was correct? The hypothesis was proven?

Yes, within the limits of normal uncertainty of experiments, the experiments are valid, the data seemed to be well interpreted, and the hypothesis was supported.

A few possible uncertainties:

- a. Too few data points so correlation might not be so strong. The lack of more data points are due to experimental difficulties.
- b. Correlation is not causation. There is a possibility that the active site is something else, but its amount correlates with edge length.

(6) What is the significance of this study?

Revelation of active site for MoS₂; suggestion of MoS₂ as a good HER catalyst.

(7) What is the weakness of the work?

The catalyst studied here is not practical to make or scale up. Real catalysts might be more complex.