

**Electrochemical deposition of amorphous molybdenum sulfide for hydrogen evolution catalysis**

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Recently, amorphous molybdenum sulfide has attracted attention as a chemically active electrocatalyst for hydrogen evolution reaction (HER). In this work, we describe an amorphous molybdenum sulfide ( $\text{MoS}_x$ ) film coated on electrochemically pre-treated carbon fiber paper (EP-CFP) by using a simple electrochemical deposition method. The performance of  $\text{MoS}_x$  catalyst on EP-CFP can be dramatically improved by adjusting the number of cycle for the electrochemical deposition. The  $\text{MoS}_x/\text{EP-CFP}$  exhibits a high cathodic current density ( $10 \text{ mA/cm}^2$ ) even at a low overpotential of 208 mV versus reversible hydrogen electrode. Furthermore a low Tafel slope of 41 mV per decade of the amorphous  $\text{MoS}_x$  catalyst reveals a rate-determining desorption step in the Volmer – Heyrovsky mechanism of the HER.