

Development of Efficient Electrocatalysts Based on Mo-compounds for Electrochemical Hydrogen Production

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Development of efficient electrocatalysts for hydrogen evolution reaction (HER) with earth-abundant, non-precious materials is crucial for practical large-scale hydrogen production from electrochemical water splitting. Molybdenum compounds are attracting great attention as a promising alternative to Platinum. Here we prepared molybdenum carbide, nitride, and sulfide nanocrystals on CNT-graphene hybrid support via modified urea-glass route and their electrochemical activities for HER were systematically investigated. By changing the amount of urea or replacing urea with thiourea, it was possible to control the final phases of the products from nitride, carbide to sulfide. Among the prepared catalysts, Mo₂C/CNT-graphene shows the highest activity for hydrogen evolution reaction (HER) with a small overpotential of 62 mV and Tafel slope of 58 mV/dec as well as an excellent stability in acid media. The performance represents one of the best among recently reported Mo-based electrocatalysts. Vastly improved electron transfer characteristics by incorporating CNT-graphene hybrid and low hydrogen binding energy compared to the others are mainly responsible for the excellent activity.