Titanium-doped molybdenum phosphide nanoparticles as robust hydrogen evolution catalyst for polymer electrolyte membrane electrolyzers

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Electrochemical production of hydrogen from water has been directed to the search for non-metal based and earth-abundant catalysts. Among them, metal phosophide have been identified as promising hydrogen evolution catalyst electrocatalyst. In this study, titanium-doped molybdenum phosphide nanoparticles were synthesized via phosphidation of Ti-doped MoO2 nanoparticles which is prepared by ultrasonic spray pyrolysis and solvothermal polyol reduction. By doping MoP with Ti, electron density of P and Mo is increased by the low electronegativity of Ti. The increase of electron density of P and Mo contribute to improve stability and catalytic activity of catalyst. A catalyst ink for using electrode was fabricated by mixing with Nafion solution, isopropyl alcohol and catalyst. Hydrogen evolution reaction (HER) of Ti-doped MoP catalyst showed higher reduction current and excellent durability even after 16000 cycles of repeat experiment than pristine MoP catalyst