Direct growth of molybdenum selenosulfide on carbon fiber paper as a competent electrocatalyst for hydrogen evolution

Ranjith Bose, 고동현[1], 한승주[1], Zhenyu Jin[1],
신석희[1], 민요셉[1,†]
건국대학교; [1]건국대학교 화학공학과
(ysmin@konkuk.ac.kr†)

Electrocatalysts for hydrogen evolution reaction (HER) have been developed to act obvious roles in the strategy of alternative energy devices for clean and sustainable energy. In this work, we describe a method to directly grow amorphous molybdenum selenosulfide ($MoSe_xS_y$) films on carbon fiber paper (CFP) by using a simple hydrothermal process. We have performed a systematic control of selenium precursor concentration to investigate growth behavior of molybdenum selenosulfide, because the composition of selenium gives significant influence on the HER performance of the catalyst. Interestingly, cathodic current density from the HER on the $MoSe_xS_y$/CFP exceeds that on the MoS_x/CFP in the whole potential range, indicating that the alloyed catalyst effectively diminishes the energy input to activate the HER. The overpotential to reach a current density of 20 mA/cm^2 is only around 178 mV on the $MoSe_xS_y$/CFP electrocatalyst. In addition, the catalyst shows a Tafel slope of 42 mV/dec, revealing the Volmer-Heyrovsky mechanism of the HER.