Transition-metal-based NiCoS/C-dot nanoflower as a stable electrocatalyst for hydrogen evolution reaction

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Developments of highly efficient materials as electrocatalysts to produce hydrogen have been significant topics over the past few decades. Currently, noble metals like platinum, palladium, gold, iridium, and rhodium are being used as the best catalyst for the hydrogen evolution reaction (HER), but the high cost and low abundance of these materials limit their wider application. Therefore, we synthesized transition-metal-based NiCoS/C-dot by the hydrothermal method where carbon dots (C-dots) act as a structure-directing agent and sulphur enhances the conductivity of the catalyst. Herein, the synthesis temperatures were changed in the range from 120 to 240 ^{0}C. Among all, NiCoS/C-dot synthesized at 150 ^{0}C shows the best HER performance effectively. In more detail, at this temperature, NiCoS/C-dot exhibits an onset potential of 96 mV and an overpotential of 232 mV. Especially, as-prepared NiCoS/C-dot nanonflower subjects to long-term stability over 20h required to produce a current density of 10 mA/cm^{2}, making it a promising low-cost candidate for hydrogen production catalyst.