

## Effect of Synthesis Temperature on NiCoS Catalyst for Efficient Hydrogen Evolution Reaction

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Hydrogen is being considered as the most efficient environment friendly energy carrier, which can be produced directly by water splitting. Nowadays, Pt metal group shows the best HER performance; however, their disadvantages such as high cost and unstable supplies are drawbacks toward commercial scale-up application. Transition metal based catalysts may be the solution for this problem. In this work, we used C-dot as a structure-directing agent to obtain NiCoS nano-flower by solvothermal method. We synthesized sulfur doped NiCo, where sulfur enhances the conductivity and activity of catalysts. Herein, the synthesis temperatures were changed, ranging from 120 to 240 °C to get various synthesized catalysts. Among them, NiCoS synthesized at 150 °C shows the best HER performances. Furthermore, this catalyst maintains its catalytic activity for at least 12 h at current densities 10 mA cm<sup>-2</sup>. Therefore, this catalyst can be a promising candidate for hydrogen production.

Key words: NiCo alloy, S-doping, Carbon dots, Nano-flower, Transition metal, Hydrogen Evolution Reaction.