Incorporation of the Ni@C core-shell nanoparticles to the solar to hydrogen generation system based on CIGS sub-module

Ngo Quang Tung, Oleksii Omelianovych, Nguyen Ngoc Anh, Nguyen Van Toan, Trinh Van Huy, 이경과[1], Liudmila Larina, 이규복, 최호석†

충남대학교; [1]한국원자력연구원

(hchoi@cnu.ac.kr†)

Continuous hydrogen generation from electrocatalytic water splitting, where energy is supplied from the photovoltaic cell is a promising technology for uninterrupted fuel production and storage. However, the development and optimization of economically feasible bifunctional electrocatalyst and solar cells remain challenging. In this work, we develop cheap Ni@C core@shell nanoparticles using an electrical explosion of wires method and apply it as a bifunctional catalyst for the overall water-splitting reaction. The thickness of the carbon shell can be controlled via experimental parameters. Depending on the thickness, carbon shell can effectively protect the metallic core from oxidation, while providing a porous structure supplying high surface area, which in turn enhances catalytic activity. Furthermore, we manufactured CIGS cells and constructed a suitable CIGS sub-module to construct a solar to hydrogen generation system. Combining CIGS sub-module and Ni@C-based electrolyzer we achieved overall solar to the hydrogen conversion efficiency of 8.14%, with 13.1% efficiency of sub-module at the operating point.