Activating MoS_2 Basal Plane with Ni_2P Nanoparticles for Hydrogen Evolution Reaction in Acidic Media

김민경, 이재성†
UNIST
(jlee1234@unist.ac.kr†)

Molybdenum sulfide (MoS_2) displays a modest hydrogen evolution reaction (HER) activity in acidic media because the active sites are limited to a small number of edge sites with broader basal planes remaining mostly inert. Here, we report that the MoS_2 basal planes could be activated by growing nickel phosphide (Ni_2P) nanoparticles on them. A Ni_2P/MoS_2 heterostructure is constructed via in situ phosphidation of an indigenously synthesized $NiMoS_4$ salt as a single precursor to form a widely cross-doped and chemically connected heterostructure. The conductivity and stability of the Ni_2P/MoS_2 are further enhanced by hybridization with conductive N-doped carbon supports. As a result, the Ni_2P/MoS_2/N:RGO or Ni_2P/MoS_2/N:CNT electrocatalyst displays Pt-like activity, outperforming the best HER electrocatalyst, Pt/C, in a more meaningful high current density region making them a promising candidate for practical water electrolysis applications. Since nonprecious metal catalysts showing Pt-like HER performance in acidic media are rare, the Ni_2P/MoS_2 heterostructure is a promising candidate for practical hydrogen production.