

Corrosion and alloy engineered high current density electrodes for efficient water splitting

Rajan Hashikaa, 이성철[†]

한양대학교

(scyi@hanyang.ac.kr[†])

Alongside rare-earth metals, Ni, Fe, Co, Cu are some of the critical materials that will be in huge demand to foresee the disruptive growth in clean-energy sector. Understanding the materials criticality, via sustainable approach of recycling, herein for water electrolysis scrap stainless steel wires (SSW) from worn-out tires are employed as a support material for catalyst integration in hydrogen evolution reaction (HER). The cathode scrap SSW with active (alloy) coatings of MoNi₄, catalyses HER at $\eta_{-200} = 77$ mV, with low activation energy ($E_a = 16.338$ kJ mol⁻¹) and high durability of 150 h. Promisingly, MoNi₄-SSW electrode under industrial operating conditions of 5 M KOH, 343 K demonstrates abnormal activity by yielding cathodic current density of 1000 mA cm⁻² at $\eta = 161$ mV respectively. This work may inspire researchers to explore and reutilize high-demand metals from scrap for addressing critical material shortfalls in clean-energy technologies.