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Highly Effective Electrochemical Water Oxidation by Millerite-Phased Nickel Sulfide Nanoflakes Fabricated on Ni Foam by Aerosol-Assisted Chemical Vapor Deposition

Fabrication of effective and low-cost electrocatalysts for water splitting is critical to sustainable energy-conversion technologies. We report the synthesis of nickel sulfide (NiS) nanoflakes by aerosol-assisted chemical vapour deposition (AACVD) on Ni foam. Upon electrochemical measurements, NiS nanoflake films exhibit excellent oxygen evolution reaction (OER) activity and stability in basic solutions, advancing an attractive alternative to precious metals and other transition-metal catalysts that have been extensively investigated. The NiS@Ni-Foam prepared at 350°C offered a high current density of 1100 mA/cm2 at an overpotential of 450 mV with a Tafel slope of 81.3 mV/dec. Furthermore, it remained durable at a constant current for >15 h in 1 M KOH solution. The high OER activity of NiS@Ni-Foam prepared at 350 °C is due to the nanoflake-like morphology and crystalline structure, as observed under scanning electron microscopy (SEM), high-resolution transmission electron microscopy (HR-TEM), and X-ray diffraction (XRD). Likewise, NiS@Ni-Foam prepared at 350°C provided a high specific surface area for facile ion transport, charge transfer, and enormous electrochemical active sites. Hence, it collectively resulted in enhanced water splitting oxygen evolution reaction (OER).

Biography

Naseer Iqbal acquired PhD degree from the University of Vienna, Austria in 2011. My dissertation is based on developing, QCM Sensor Arrays for Monitoring Volatile plant Emanations Via Molecularly Imprinted Polymers. Earlier, I studied Chemistry at Quaid-i-Azam University, Islamabad. I was awarded MSc & MPhil degrees in inorganic/analytical chemistry in 2002 and 2004, respectively. My research interests are focused on developing nanostructured materials: polymer coatings,organic-inorganic hybrid polymers & nanocomposites films,nano-particles, biomaterials etc. I am interested in utilizing these nanomaterials for advanced energy materials, chemical & bio-sensors, lab-on-chip devices, microfluidics, nano/micro-fabrication of nano-materials/bio-materials for diverse chemical, biomedical and renewable energy applications.

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