# Electrodeposited Cobalt-based nanocomposite as an efficient electrocatalyst for overall water splitting

Suh-Ciuan Lim (林淑娟) and Yan-Gu Lin (林彥谷)*

Materials Science Group, Scientific Research Division, National Synchrotron Radiation Research Center (NSRRC), Hsinchu, Taiwan

*email: lin.yg@nsrrc.org.tw

**Abstract**

Design and development of high-efficiency non-noble bifunctional electrocatalysts for hydrogen evolution reaction (HER) and oxygen evolution reaction (OER) is crucial for water splitting process and associated renewable energy systems. This study presents the fabrication of cobalt-based nanostructure on a three-dimensional macro-porous Ni foam (NF) substrate by a facile electrodeposition method and shows extraordinary performance for HER and OER and excellent electrochemical stability. As a robust 3D $H_2$ or $O_2$-evolving electrode in 1.0 M KOH, the as-prepared electrocatalyst achieve a small overpotential for both of HER and OER at a current density of 10 mA $cm^{-2}$. When employing as an alkaline electrolyzer, the multimetallic nanostructure catalyst demonstrates a low cell voltage at current density of 10 mA $cm^{-2}$ with extremely high stability, making it a promising dual-functional electrocatalyst in the field of water splitting.

***Keywords - Electrocatalyst, Hydrogen evolution, Oxygen evolution, Water Splitting, Multimetallic Nanostructure***