

Cobalt doped titanium dioxide nanoparticles: Synthesis, characterization and electrocatalytic study

Samira Bagheria · Fereshteh Chekin*,b · Sharifah Bee Abd Hamida

Nanotechnology & Catalysis Research Centre (NANOCAT), IPS Building, University Malaya, 50603 Kuala Lumpur, Malaysia

bDepartment of Chemistry, Islamic Azad University, Ayatollah Amoli Branch, Amol, Iran

*Corresponding Authors: Tel.: +98 121 2517000; Fax: +98 121 2517043

E-mail address: fchekin@yahoo.com 2

Abstract In this work, green synthesis of cobalt doped titanium dioxide (Co-TiO₂) has been carried out in aqueous medium using gelatin. The Co-TiO₂ particles have been characterized using transmission electron microscopy (TEM), X-ray diffraction (XRD), energy dispersive X-ray (EDAX), FT-IR spectroscopy and voltammetry techniques. XRD results show pure Co-TiO₂ and TiO₂ powders with average crystallite size about 12 nm and 15 nm, respectively. Co loaded in TiO₂ hasn't influence crystalline structure. Moreover, efficient Co-TiO₂-based anode was fabricated by casting of the Co-TiO₂ solution on glassy carbon electrode (Co-TiO₂/GCE). The electrocatalysis of oxygen evolution reaction (OER) at Co-TiO₂/GCE has been examined using linear scanning voltammetry (LSV) in alkaline media. The OER is significantly enhanced at Co-TiO₂/GCE, as demonstrated by a negative shift in the LSV curve at the Co-TiO₂/GCE compared to that obtained at the unmodified one. The value of energy saving of oxygen gas at a current density of 5 mA cm⁻² is 12.6 kW h kg⁻¹. The low cost as well as the marked stability of the modified electrode make it promising candidate in industrial water electrolysis process.

Keywords: Cobalt doped titanium dioxide, Oxygen evolution reaction, Gelatin, Electrocatalyst