Ultrahigh surface area IrO_x@IrO_2 catalyst induced by glycine with balanced activity and stability for efficient water splitting

백채경, 이승우, 박찬호†
광주과학기술원
(chanho.pak@gist.ac.kr†)

Polymer electrolyte membrane water electrolysis (PEMWE), using intermittent renewable energy, plays a key role in storing energy in the form of hydrogen. Developing a highly active and durable catalyst using a simple method for the oxygen evolution reaction (OER) is required for the widespread application of PEMWE. Herein, IrO_x@IrO_2 catalyst with an ultra-high surface area (G–450) was synthesized by a simple Adams fusion method with glycine as an additive. The effect of glycine as an additive during synthesis on the properties of catalysts was investigated by changing the amount of glycine and the heat-treated temperature. Owing to the micro/mesoporous structure, an ultrahigh specific surface area (SSA) of 403 m^2g^{-1} was achieved. From the X-ray absorption characterizations, an amorphous structure with average oxidation states of Ir(IV) was observed. Surface-rich Ir(III) species and a high SSA enhanced the OER activity of G–450 (308 mV overpotential at 10 $mAcm^{-2}$) compared to the IrO_2 prepared without glycine. The G–450 exhibited an Ir dissolution rate that was 2.5 times lower than that of IrO_2 prepared at 350 °C (G–350), which was higher stability owing to Ir(IV) species