

Composite Electrodes Containing Ni-Fe-Cr as an Activatable Oxygen Evolution Catalyst

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Abstract : Metal oxides are known electrocatalyst in water oxidation reaction. Due to the fact that it is desirable for efficient oxygen evolution catalyst to contain numerous redox-active metal ions to guard four electron water oxidation reaction, mixed metal oxides exhibit enhanced catalytic activity towards oxygen evolution reaction compared to single metal oxide systems. On the surface of fluorine doped tin oxide coated glass slide (FTO) deposited (doctor blade technique) mixed metal oxide layer composed of nickel, iron, and chromium. Oxide coating was acquired by heat treatment of the aqueous precursors' solutions of the corresponding salts. As-prepared electrodes were photosensitive and acted as an efficient oxygen evolution catalyst. Our results showed that obtained by this method electrodes can be activated which leads to achieving of higher current densities. The recorded current and photocurrent associated with oxygen evolution process were at least two orders of magnitude higher in the presence of oxide layer compared to bare FTO electrode. The overpotential of the process is low (ca. 0,2 V). We have also checked the activity of the catalyst at different known photoanodes used in sun-driven water splitting. Herein, we demonstrate that we were able to achieve efficient oxygen evolution catalysts using relatively cheap precursor consisting of earth abundant metals and simple method of preparation.

Keywords : chromium, electrocatalysis, iron, metal oxides, nickel, oxygen evolution

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