

The structural study of Pt supported on TiO₂ catalyst doped by Nb

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In this paper, niobium doped titanium oxide (Nb_xTi_{1-x}O₂, x=0.1, 0.005) were synthesized and investigated as a cathode catalyst support material for polymer electrolyte membrane fuel cell (PEMFC). Two different methods to synthesis the catalysts: (1) a room temperature synthesis for Nb_xTi_{1-x}O₂ (x=0.1, 0.005) via a surfactant templating, and (2) high temperatures synthesis (700°C and 1000°C) for Nb_xTi_{1-x}O₂ (x=0.1). X-ray absorption spectroscopy (XAS) and X-ray diffraction (XRD) techniques were applied for characterization of synthesized supporting material. Niobium doped titanium oxide supported Pt nanocatalyst synthesized; using polyol method was characterized by SEM technique. Pt particle sizes, interatomic distances and distribution were found by XRD, Raman scattering, XAS and SEM.

Titanium dioxide exists in three crystalline forms: the most common types are rutile and anatase. Among three phases, rutile crystalline is the thermally stable phases. The grain size of the rutile phase is always larger than that of the anatase phase. The anatase phase of titania is usually stabilized by cation addition.

Niobium (Nb) is known to be the most promising dopant since the similarity of the ionic radii of Nb⁵⁺ (r=0.70 Å) and Ti⁴⁺ (r=0.68 Å) results in almost no lattice distortion. Doping of TiO₂ with Nb slows down the anatase to rutile phase transformation preventing growth of the grains, and that might lead to enhancement of the specific surface area of the support. The transformation from anatase to rutile can be easily monitored using X-ray diffraction.

Biography

G. Sevjidsuren has completed her Ph.D. from National University of Mongolia. She is the Head of Fuel Cell Laboratory, Institute of Physics and Technology, Mongolian Academy of Sciences. She has published more than 40 papers in refereed journal articles.

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