

Title: Preparation and Characterization of Novel Oxide Catalysts for Fuel Cell Applications

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Abstract:

Present doctoral thesis focuses mainly on the morphological investigation of novel oxide catalysts prepared by magnetron sputtering deposition for fuel cell applications. Surface characterization techniques such as scanning electron microscopy (SEM), atomic force microscopy (AFM) and X-ray photoelectron spectroscopy (XPS), were used in this work.

In the first chapter, the influences of different preparation parameters on the morphology of CeO₂, Au doped CeO₂ and Pt doped CeO₂ sputtered films were investigated. It was found that morphology and stoichiometry of the catalyst film is strongly dependent on the deposition parameters and the type of substrate. We have also shown that catalyst films prepared by magnetron co-sputtering of platinum and cerium oxide exhibit high catalytic activity as anode in proton exchange membrane fuel cell (PEMFC). High surface area, low platinum loading and excellent catalytic performance make this material a promising alternative to more expensive commercial catalysts.

In the second chapter, the morphology of PtO_x films prepared by reactive magnetron sputtering of platinum in oxygen atmosphere were examined. It was shown that PtO_x, when reduced by H₂, exhibit large active surface area. Such platinum films were found to be high active catalyst as anode in PEMFC.

Keywords: Cerium Oxide, Platinum, Platinum Oxide, Magnetron Sputtering, Fuel Cell