

Title: *Investigation of magnetron sputtered Pt-CeO₂ thin film catalyst for fuel cell applications.*

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Abstract:

This doctoral thesis focuses on magnetron sputtered Pt-doped CeO₂ thin films that were found to be very active catalysts in proton exchange membrane fuel cells (PEMFC). The films were prepared on different substrates (silicon wafers, carbon nanotubes and flat carbon substrates) and investigated mainly by means of Hard x-ray photoelectron spectroscopy (HAXPES). The HAXPES method showed that deposition of the Pt doped cerium oxide catalyst layers on carbon nanotubes and flat carbon substrates by magnetron sputtering leads to growth of a highly porous “Pt-Ce-O” solid solution film, where platinum is mostly in ionic states, Pt²⁺, Pt⁴⁺. The results obtained showed that the mechanism of film growth is strongly influenced by interaction of the Ce atoms with the substrate and their oxidation by oxygen containing RF plasma. The formation of Ptⁿ⁺ states together with the porous character of the catalyst films are used to explain the high activity of Pt-CeO₂ catalyst in PEMFCs.

Keywords: *magnetron sputtering, cerium oxide, Pt, XPS, SRPES.*