Title: *High pressure CO and methanol oxidation study over nanopowder Rare Earth Oxides and platinum thin film catalysts*

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Abstract:

This doctoral thesis focuses on reactivity study of nanopowder rare earth oxides (REOs) and platinum based thin film catalysts using microreactor with high pressure reaction cell. REOs nanoparticles were prepared by new approach based on sol-gel chemistry. Magnetron sputtering technique was used for preparation of thin film samples.

In the first part of the thesis CO oxidation on REOs and on Pt, PtO_x thin films were performed. Among prepared REOs catalyst better activity exhibited alumina stabilized ceria, due to higher surface area. Both Pt and PtO_x deposited on silicon substrate exhibited similar activity. When carbon (G-foil or C interlayer) is used as support, activity of Pt thin film decreases while PtO_x preserves high activity.

In the second part of the thesis steam reforming of methanol (SRM) and partial oxidation of methanol (POM) were performed on Pt thin films. It was shown that PtO_x thin film exhibited superior activity compared to other samples with the same thickness. It is due to the reduction of platinum oxide to metallic platinum ($Pt^{4+} \rightarrow Pt^0$). Also high POM activity was demonstrated by 1 nm thick Pt-CeO_2 thin film. Presence of trace amount of ceria in such layer has been found to be a key factor in formation of granular surface structure, resulted in better activity and stability of such catalyst.

Keywords: *CO oxidation, methanol oxidation, REOs, platinum oxide.*