Turkish Journal of Chemistry

Turkish Journal

of

Chemistry

Comparative study of selective CO oxidation over Pt-Co-M/Al_2O_3 catalysts (M=Ce, Mg, Mn, Zr, Fe) in hydrogen-rich streams: effects of a second promoter

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Keywords
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Abstract: The selective CO oxidation over Pt-Co/Al_2O_3 catalyst in hydrogen-rich streams was studied in the presence of Ce, Mg, Mn, Ze, and Fe as the second promoters. The catalysts were prepared using incipient to wetness co-impregnation, and tested in a microflow reaction system. The effects of the second promoter were investigated in near 100% CO conversion conditions both in the absence and presence of CO_2 and H_2O in the feed. 100% CO conversion was obtained with the addition of each second promoter at 110 °C while Pt-Co/Al_2O_3 catalyst had 96%-98% CO conversion. It was also found that changing the Pt ratio from 1.4 wt.% to 0.7 wt.% at 110 °C did not have any significant effects on catalysts containing Ce, Mg, or Mn, and it had negative effects in the case of Fe and Zr. The CO conversion decreased for all the catalysts in the presence of 25% CO_2 in the feed as expected, and recovered fully or significantly with the addition of 10% H_2O. The addition of Ce, Mg, and Mn as the second promoter also improved the performance 2%-3% compared to Pt-Co/Al_2O_3 catalysts in the presence of CO and H_2O. The increase in the reaction temperature to 130 °C decreased the CO conversion over all the catalysts.

Key Words: Selective CO oxidation, promoted Pt catalysts, Pt-Co/Al_2O_3 catalyst, fuel cell, fuel processor.

Turk. J. Chem., **33**, (2009), 545-553.
Full text: pdf
Other articles published in the same issue: Turk. J. Chem.,vol.33,iss.4.