

Turkish Journal of Chemistry

Turkish Journal

Deactivation of a Co-Precipitated Co/Al₂O₃ Catalyst


of

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Abstract: The effects of reaction temperature, feed ratio, space time, and CO percentage in feed on the deactivation conditions of a co-precipitated 36 wt% Co/Al₂O₃ catalyst in CO hydrogenation were investigated. Environmental-SEM-EDX and temperature-programmed reduction (TPR) studies were performed on used catalysts to investigate the effect of reaction conditions on catalyst deactivation. Intensive coke deposition on the catalyst was observed at a reaction temperature of about 573 K. Increasing the H₂/CO ratio also increased the catalyst activity. Methane formed as the main product at high H₂/CO ratios. Although catalyst activity did not change significantly during the 9-h reaction period at all conditions, a maximum of 6.8% C deposition was observed with increasing H₂/CO, and this caused a 2% decrease in the total surface area of the used catalyst. Space time and CO percentage in the feed had less influence on catalyst decomposition.

Key Words: Fischer-Tropsch synthesis, catalyst deactivation, cobalt-alumina catalysts, CO hydrogenation, co-precipitation

Turk. J. Chem., **31**, (2007), 515-521.

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