Dimethyl ether oxidation over Fe_xM_{1-x} (M=Co, Cu) mixed oxides

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ABSTRACT

Catalytic oxidation (combustion) technologies are widely used for industrial air pollution abatement. Compared with thermal combustion, higher efficiencies are reached at lower operating temperatures with considerable environmental and economic benefits.

Dimethyl ether can be a replacement for liquefied petroleum gas (LPG) and diesel fuel and can be also found in the flue gas of a formaldehyde production plant as a pollutant. Noble metal-based catalysts (e.g., Pt and Pd) have been used as efficient catalysts in DME catalytic combustion due to their high activity at low temperatures and stability but they are costly. From the other hand, transition metal oxides have been proven to be an attractive alternative since they are active in VOC abatement, thermally stable and cost-effective.

In the present work, Fe_xCo_{1-x} and Fe_xCu_{1-x} mixed oxide catalysts have been synthesized with varying x=Fe/(Fe+Co) or x=Fe/(Fe+Cu) atomic ratios via the citrate method and their catalytic performance was examined in the oxidation of dimethyl ether. Catalysts were characterized by N_2 physisorption, XRD and XPS. Superior catalytic activity of DME oxidation was measured for cobalt-iron mixed oxide catalysts compared to copper-iron ones. The most promising mixed oxide catalyst was the $Fe_{0.25}Co_{0.75}$ but, at the same time, was considerably inferior to Co_3O_4 pure oxide. Texture and other structural and physicochemical characteristics are correlated to catalytic activity results.

REFERENCES

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