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Influence of Carbon Addition on the Activity of Silica Supported Copper and Cobalt Catalysts in NO Reduction with CO

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Abstract : Exhaust gases from stationary and mobile combustion sources contain nitrogen oxides that cause a variety of environmentally harmful effects. The most common approach of their elimination is the catalytic reaction in the exhaust using various reduction agents such as NH3, CO and hydrocarbons. Transition metals (Co, Ni, Cu, etc.) are the most widely used as active components for deposition on various supports. However, since the interaction between different catalyst components have been extensively studied in different types of reaction systems, the possible cooperation between active components and the support material and the underlying mechanisms have not been thoroughly investigated. The support structure may affect how these materials maintain an active phase. The objective is to investigate the addition of carbonaceous materials with different nature and texture characteristics on the properties of the resulting silica-carbon support and how it influences of the catalytic properties of the supported copper and cobalt catalysts for reduction of NO with CO. The versatility of the physico-chemical properties of the composites and the supported copper and cobalt catalysts are discussed with an emphasis on the relationship of the properties with the catalytic performance. The catalysts were prepared by sol-gel process and were characterized by XRD, XPS, AAS and BET analysis. The catalytic experiments were carried out in catalytic flow apparatus with isothermal flow reactor in the temperature range 20–300oC. After the catalytic test temperature-programmed desorption (TPD) was carried out. The transient response method was used to study the interaction of the gas phase with the catalyst surface. The role of the interaction between the support and the active phase on the catalyst's activity in the studied reaction was discussed. We suppose the carbon particles with small sizes to participate in the formation of the active sites for the reduction of NO with CO along with their effect on the kind of deposited metal oxide phase. The existence of micropore texture for some of composites also influences by mass-transfer limitations.

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