Improvement of Catalytic Activity of Iron Oxide Powder from Waste Pickle Liquor of Steel Industry by combination of Copper and Cobalt Oxide Powder Catalysts

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ABSTRACT:

In this study, the behavior of iron oxide powder which is the by-product of the pickling section of cold roll steel plate production plant has been investigated in order to filter or reduce the amount of carbon monoxide gas of pollutant gas. For improving the catalytic properties of iron oxide powder, copper and cobalt iron composite oxide have been prepared by grinding method. The structure of powder and size of particles were determined by using XRD and DLS methods. Furthermore, specific surface area of powder was measured by using BET method. The catalytic activity and stability of the catalysts on CO oxidation were investigated and results exhibited that oxidant properties have improved significantly. Catalytic test demonstrated that the initial temperature for beginning of catalytic reaction was around 300$^{\circ C}$ and the temperature for complete removal of carbon monoxide was around 600$^{\circ C}$. In the case of composite compounds the initial temperature and the temperature for complete removal were decreased significantly and were respectively around 260$^{\circ C}$ and 280 $^{\circ C}$. Stability test showed that catalytic activity of powder not only was not decreased during long-term service but also it was increased. In fact, cycle durability, stability in high temperature and reaction rate of iron oxide powder have been improved by making composite.

Key words: CO Oxidation, Nanoparticles, Catalytic Activity, Cuo/CoO Catalysts, Iron, Cobalt

INTRODUCTION:

Removal of carbon monoxide and reduction the amount of some of destructive hydrocarbons have been regarded in the recent years. Noble metals such as gold, platinum, and silver have a great performance as catalysts but due to their price and causing some environmental issues, their applications have been restricted [1-14]. Nowadays, using active nanoparticles such as gold and silver nanoparticles as nanocatalyst for pollutant gas filtering have been considered, however these group of material have not been applied widely because of their cost. In order to solve this problem researchers replaced different stable metallic oxide in nano-scale. This group of material costs less than nanoparticles of platinum, gold, and silver and are much more available and will