

Effect of cobalt on nickel oxide toward reduction behaviour in hydrogen and carbon monoxide atmosphere

ABSTRACT

The reduction behaviour of cobalt doped with nickel oxide and undoped nickel oxide (NiO) by hydrogen (H₂) in nitrogen (20%, v/v) and carbon monoxide (CO) in nitrogen (40%, v/v) atmospheres have been investigated by temperature programmed reduction (TPR). The phases formed of partially and completely reduced samples were characterized by X-ray diffraction spectroscopy (XRD). TPR results indicate that the reduction of Co doped and undoped nickel oxide in both reductants proceed in one step reduction (NiO → Ni) without intermediate. TPR results also suggested that by adding Co metal into NiO, the reduction to metallic Ni by both reductant gaseous give different intensity of the peak. The reduction process of Co and undoped NiO become faster when H₂ was used as a reductant. Furthermore, in H₂ atmosphere, Co-NiO give complete reduction to metallic Ni at 700 °C. Meanwhile, XRD analysis indicated that NiO without Co composed better crystallite phases of NiO with higher intensity.

Keyword: Carbon monoxide; Cobalt; Nickel Oxide; Reduction; TPR