



XAS study of thermal interaction of nickel with alumina

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Various instrumental techniques including X-ray absorption spectroscopy (XAS) were used to investigate chemical transformation of nickel in Ni-containing alumina that has been thermally treated for 2 hours at 500—1100°C. A shoulder towards the edge jump of the sample XANES spectrum was observed for the 1100°C-heated alumina, suggesting a great distortion of the Ni(II) environment; whereas this was not observed in the Ni XANES spectra from the 105°C and 500°C heated samples. The distortion of Ni(II) environment suggested the occurrence of chemical reaction between nickel compound and alumina during the 1100°C heating process, as supported by the formation of NiAl₂O₃ observed in XRD patterns. EXAFS results were also supportive of the existence of the distorted Ni(II) environment. Ni in the alumina heated at higher temperature was much less leached by extraction using either glacial acetic acid or 0.1 N HCl. Both NiO formation and its chemical reaction with alumina to form NiAl₂O₄ are responsible for the low leaching percentage from the 1100°C-heated alumina.