Powder Metallurgy and Metal Ceramics

Volume 56, Issue 3, 2017, Pages 148-157

STRUCTURAL AND MAGNETIC PROPERTIES OF Fe–Co/Al2O3NANOCOMPOSITE POWDER PRODUCEDBY MECHANICAL ALLOYING

A. Younes, N. E. Bacha, M. Zergoug, N. Dilmi

Abstract: The effect of milling time and addition of elements on the microstructure, magnetic and mechanicalproperties of the Fe–xCo (x = 0, 5, 10, and 20 wt.%) matrix nanocomposite reinforced with 40 wt.%Al2O3 during mechanical alloying is examined. Fe–Al2O3 and Fe–Co–Al2O3 alloys are milled for 5,15, 20, and 30 h and 20 h, respectively. The balance between the welding and fracturing and asteady-state situation is found out in the Fe–Co–40 wt.% Al2O3 nanocomposite after 20 h, due to theCo introduction into the Fe matrix, but not in the Fe–Al2O3 nanocomposite. After 30 h of milling, theaverage crystallite size was 5 nm in the Fe matrix. The lattice strain increased to ~0.64% in the Fematrix after ?30 h of milling and in the binary Fe–20 wt.% Co matrix after 20 h of milling; theaverage crystallite size was 3 nm. The lattice strain increased to ~0.56% for the Fe–20 wt.% Comatrix after ?20 h of milling. The coercive field (Hc) increased from 6.407 to 82.027 Oe, while thesaturation magnetization (Ms) decreased from 20.732 to 15.181 emu/g in the Fe matrix duringmilling. The Hc and Ms are maximum for the binary matrix (20 and 10% Co, respectively)

Keywords : Fe–Co matrix nanocomposite, alumina, Mechanical Alloying, microstructural evolution, magnetic properties.