

Wet Chemical Synthesis for Fe-Ni Alloy Nanocrystalline Powder

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Abstract : We have synthesized nanocrystalline Fe-Ni alloy powders where Ni varies as 10, 30 and 50 mole% by a wet chemical route (sol-gel auto-combustion) followed by reduction in hydrogen atmosphere. The ratio of citrate to nitrate was maintained at 0.3 where citric acid has worked as a fuel during combustion. The reduction of combusted powders was done at 700°C/1h in hydrogen atmosphere using an atmosphere controlled quartz tube furnace. Phase and microstructure analysis has shown the formation of α -(Fe,Ni) and γ -(Fe,Ni) phases after reduction. An increase in Ni concentration resulted in more γ -(Fe,Ni) formation where complete γ -(Fe,Ni) formation was achieved at 50 mole% Ni concentration. Formation of particles below 50 nm size range was confirmed using Scherrer's formula and Transmission Electron Microscope. The work is aimed at the effect of Ni concentration on phase, microstructure and magnetic properties of synthesized alloy powders.

Keywords : combustion, microstructure, nanocrystalline, reduction

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