Effect of Si on the Magnetic and Mechanical Properties of Arc Melted Soft Magnetic Fe-Si-Al Alloys

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This work aims to study the effect of silicon addition on structural, mechanical and magnetic properties of arc melted Fe-Si-Al Sundust alloys. Analysis of x-ray diffraction data on arc-melted ingots were used to calculate the lattice parameters, lattice strain and crystallite size. Scanning Electronic Microscopy analysis confirmed high-density materials synthesized by arc-melting. Vickers microhardness (HV) tests showed a significant enhancement with increasing silicon. Magnetic susceptibility, under 0.5T, showed a composition and temperature dependent behavior.

Key words: Fe-Al-Si, sendust alloys, Vickers microhardness, magnetic susceptibility, order-disorder transition, Fe solid solution, ordered DO_3 (α_1-$Fe_3Si_{0.7}Al_{0.3}$) phase.