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EFFECT OF NICKEL DOPING ON THE MAGNETIC AND MECHANICAL PROPERTIES OF B2 FeCo ALLOY

FeCo alloy belongs to the category of intermetallic soft magnetic material. It exhibits the highest saturation magnetisation (~2.4 Tesla) among commercially available soft magnetic materials, along with high Curie temperatures (920–985 ⁰C) and good mechanical strength which make it suitable for various applications. However, this alloy ‘s widespread applications are restricted because of the high cost of Co and low ductility at low temperatures. The aim is to determine how Ni enhances ductility while maintaining the magnetic strength and stability. This study employs the Density Functional Theory (DFT) approach to investigate the effect of Ni on the structural, magnetic, and mechanical properties of B2 Fe₅₀Co_{50-x}-xNi_x alloys ($0 \leq x \leq 50$). Formation enthalpies, elastic constants, and phonon dispersion curves will be analysed to assess thermodynamic, mechanical and vibrational stability, respectively. Building on previous findings for Fe-Co-V alloys, Ni is expected to further improve ductility by lowering the shear modulus-to-bulk modulus ratio. These insights will help evaluate Fe₅₀Co_{50-x}-xNi_x alloys as potential candidates for high-ductility applications.

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