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Ferromagnetic element microalloying and clustering effects in high B_s Fe-based amorphous alloys

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Abstract

$Fe_{83}(Co_x,Ni_y)(B_{11}Si_2P_3C_1)_{1-x,y/17}$ (x, y=1-3) amorphous alloys with high saturation magnetic flux density (B_s) and excellent soft-magnetic properties were developed and then the microalloying and clustering effects were explored. The microalloying of Co and Ni improves the B_s from 1.65 T to 1.67-1.72 T and 1.66-1.68 T, respectively. The Ni-doped alloys exhibit better soft-magnetic properties, containing a low coercivity (H_c) of about 5.0 A/m and a high Effective permeability (μ_e) of (8-10)×10^3, whereas the microalloying of Co leads to a deteriorative H_c of 5.0-13.0 A/m and a μ_e of (5-8)×10^3. Moreover, microalloying of Ni can increase the ductile-brittle transition