Influence of P substitution for B on the structure and properties of nanocrystalline $Fe_{73.5}Si_{15.5}Nb_3Cu_1B_{7-x}P_x$ alloys

Chau N., Luong N.H., Chien N.X., Thanh P.Q., Van Vu L.
Center for Materials Science, National University of Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam; Department of Solid State Physics, National University of Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam

Abstract: Amorphous ribbons of $Fe_{73.5}Si_{15.5}Nb_3Cu_1B_{7-x}P_x$ (x=0,1,2,3, and 4) have been prepared by rapid cooling on a single copper wheel. The crystallization of α-Fe(Si) phase is independent of the P content in the alloys. Based on Kissinger plots, the activation crystallization energies are determined. The size of the nanoparticles crystallized on an amorphous matrix in heat-treated ribbons is found to be 10-12nm. The crystallization fraction is determined by using thermal-analysis equipment and we show that after 30min annealing, this fraction is over 80%. The thermomagnetic curves measured between room temperature and 1000K revealed clearly two magnetic phases: an amorphous phase at low temperatures and a crystalline one at high temperatures.
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Correspondence Address: Chau, N.; Center for Materials Science, National University of Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam; email: chau@cms.edu.vn
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Authors with affiliations:

- Chau, N., Center for Materials Science, National University of Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam
- Luong, N.H., Center for Materials Science, National University of Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam
- Chien, N.X., Center for Materials Science, National University of Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam
- Thanh, P.Q., Department of Solid State Physics, National University of Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam
- Van Vu, L., Department of Solid State Physics, National University of Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam

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