# Ultrasoft magnetic properties in nanocrystalline alloy Finemet with Au substituted for Cu

Chau N., Hoa N.Q., The N.D., Niem P.Q.

Center for Materials Science, College of Science, Vietnam National University, Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam

Abstract: The amorphous ribbon $Fe_{73.5}Si_{13.5}B_9Nb_3$ $Au_1$ has been prepared by rapid cooling on a copper wheel. The ribbon is 16.8 ?m thick and 7 mm wide. The DSC curves show the first peak at 547-579 ?C (corresponds to the crystallization of ?-Fe(Si) phase) depending on heating rate from 10 to 50 ?C/min which is a little higher than that of pure Finemet (542-570 ?C, respectively). From the Kissinger plot, the crystallization activation energy is determined and shown to be 2.8 eV for ?-Fe(Si) phase, less than that of Finemet ( E = 3.25 eV). By annealing at 530 ?C for 30, 60 and 90 min, the crystallization volume fraction of ?-Fe(Si) phase increased from 73% to 78% and 84%, respectively. After appropriate annealing, the ultrasoft magnetic properties are achieved. The maximum magnetic entropy change, {divides}??$S_m${divides}$_{max}$, showed a giant value of 7.8 J/kg K which occurred at around Curie temperature of amorphous phase of the ribbon. ?? 2006.

Author Keywords: Magnetocaloric effect; Nanocrystalline alloy; Nanoparticle; Soft magnetic amorphous system

Index Keywords: Activation energy; Annealing; Copper; Crystallization; Differential scanning calorimetry; Gold; Iron alloys; Magnetic field effects; Soft magnetic materials; Amorphous phase; Magnetocaloric effect; Nanoparticle; Soft magnetic amorphous system; Nanostructured materials

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Correspondence Address: Chau, N.; Center for Materials Science, College of Science, Vietnam National University, Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam; email: chau@cms.edu.vn

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Authors with affiliations:

1. Chau, N., Center for Materials Science, College of Science, Vietnam National University, Hanoi, 334 Nguyen Trai, Hanoi,

Viet Nam
2. Hoa, N.Q., Center for Materials Science, College of Science, Vietnam National University, Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam
3. The, N.D., Center for Materials Science, College of Science, Vietnam National University, Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam
4. Niem, P.Q., Center for Materials Science, College of Science, Vietnam National University, Hanoi, 334 Nguyen Trai, Hanoi, Viet Nam

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