

UVOD

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Short communication

Synthesis and characteristics of nanocrystalline Co/N thin film containing Co₄N phase

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Fe₄N thin film has been substantially studied by theoretical and technological researchers in the past decades due to their unique structural, ferromagnetic and thermal properties [1–5]. In contrast, cobalt nitride Co₄N has not been paid much attention until the first report on synthesis of Co/N thin films by Matsuoka et al. [6], for understanding the basic magnetic properties and their potential applications in the field of high density magnetic recording, and in integrated circuits due to their catalytic and diffusion barrier characteristics as well [7].

U uvodu autori opisuju zašto su izabrali u naslovu članka definiranu problematiku. Uočen je znanstveni problem: *nanokristalni tanki filmovi Fe₄N imaju posebna strukturna, feromagnetska i toplinska svojstva i autori se pitaju ne bi li tanki filmovi Co₄N mogli imati još bolja svojstva radi primjene u integriranim krugovima.*

Da bi se ideja mogla realizirati potrebno je kao prvo pripremiti tanke filmove Co₄N, odrediti kemijski sastav, strukturu i magnetska svojstva. Iz sažetka njihovog rada:

Nanocrystalline Co/N thin film containing Co₄N phase has been deposited on Si (1 1 1) substrate by direct current magnetron sputtering in 10% N₂/N₂ + Ar discharge. The composition, structure and magnetic properties were examined by X-ray photoelectron spectroscopy, X-ray diffraction (XRD), transmission electron microscopy (TEM) and superconducting quantum interference device. XRD and TEM investigations showed that the grain size of nanocrystalline Co₄N was in the range 10–25 nm (with the error of ±0.2 nm). Magnetic analysis indicated that the synthesized Co/N thin films had good in-plane anisotropy. The value of H_c with the domination orientation (1 1 1) was about 97 Oe. The saturation magnetization was estimated to be 103.9 ± 6.1 emu/g, which was larger than the value of 46.5 emu/g firstly reported by Oda et al.

je vidljivo da su tanke filmove pripremili pripremili metodom magnetronskog rasprašivanja, kemijski sastav rentgenskom fotoelektronskom spektroskopijom, strukturu rentgenskom difrakcijom i transmisijom elektronskom mikroskopijom, a magnetska svojstva SQUID-om.

Još jedan primjer:



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Nanocrystallisation mechanisms in FeCuNbSiB-type alloys from comparative HREM, STM, TGM and calorimetric studies

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Abstract

The process of nanocrystallisation in two alloys ($\text{Fe}_{73.5}\text{Cu}_1\text{Nb}_3\text{Si}_{13.5}\text{B}_9$ and $\text{Fe}_{77.5}\text{Cu}_1\text{Nb}_3\text{Si}_{9.5}\text{B}_9$) as a function of their annealing treatments was investigated by X-ray diffraction (XRD), differential scanning calorimetry (DSC), thermogravimetry (TGM) under magnetic field, conventional transmission electron microscopy (TEM), high-resolution transmission electron microscopy (HREM), electron diffraction (ED) and scanning tunneling microscopy (STM). In addition to information about nucleation and growth of the grains, the two microscopic methods reveal amorphous interfaces between α -Fe(Si) nanoprecipitates. It was shown by means of HREM that during annealing an overlapping of the diffusion fields between neighboring α -Fe(Si) nanoparticles causes their coalescence into grains, which saturate with the annealing time. Scanning tunneling microscopy reveals atomic resolution in the nanocrystals as well as in their grain boundaries. On the basis of these experiments we established annealing conditions which yield the best soft magnetic properties. © 1999 Elsevier Science S.A. All rights reserved.

Keywords: High-resolution transmission electron microscopy; Differential scanning calorimetry; Scanning tunneling microscopy; Thermogravimetry; Nanocrystallisation; FeCuNbSiB-type alloys

U sažetku se uočavaju korištene metode i rezultat, dok bi se čitanjem uvodnog dijela članka saznalo da su uzorci dobiveni posebnom metodom ekstremno brzog kaljenja iz tekuće faze (taljevine/taline). Ovaj članak je ujedno tipični primjer suradnje različitih znanstvenih institucija jer praksa pokazuje da je vrlo često nemoguće načiniti sva potrebna mjerenja u jednom laboratoriju ili znanstvenoj instituciji, već je često potrebna i međunarodna suradnja. U gore spomenutom članku **sinteza uzoraka** te metode **XRD, DSC, TGM** su rađene na Fizičkom odsjeku Sveučilišta u Barceloni, **TEM, HREM i ED** su napravljeni na Fizičkom odsjeku PMF-a, a **STM** na Institutu Jožef Stefan u Ljubljani.

Ukratko, istraživanje eksperimentalnih fizičara sadrži:

1. Uočavanje problematike
2. Pripremu uzoraka
3. Karakterizaciju uzoraka
4. Mjerenje fizikalnih svojstava
5. Usporedbu rezultata s postojećim eksperimentalnim rezultatima i teorijskim modelima, nove spoznaje,...
6. Objavljivanje rezultata

Nakon toga slijedi odluka:

- a) problematika je iscrpljena
- b) potrebni su dodatni uzorci, eventualno drugog kemijskog sastava i dimenzija te dodatne metode karakterizacije, novi modeli, itd.