BT04

Anisotropic Nanocomposite $Nd_2Fe_{14}B/\alpha$-Fe Magnets Prepared by Spark Plasma Sintering

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Isotropic bulk magnets were prepared by spark plasma sintering (SPS) at the sintering temperature of 700°C for 2 minutes, under a compressive stress of 400MPa. Then the magnets were hot deformed at 800°C, under 30~50MPa .The powders were $Nd1_{1.5}Dy_{0.5}Fe_{77.9}Co_3Nb_1B_{6.1}$ (containing 4vol%α-Fe) melt-spun ribbons mixed with Zn(1wt%~5wt%).

Table1. Magnetic properties of isotropic and anisotropic magnets with Zn addition.

Zn contents (wt%)	$(BH)_m$ (*kJ/m³*)		Br(*T*)		Hcj(*kA/m*)		Hk/Hcj	
	Iso	*Aniso*	*Iso*	*Aniso*	*Iso*	*Aniso*	*Iso*	*Aniso*
0%	101	57	0.81	0.91	850	153	28.6	43
1%	84	152	0.76	1.19	865	394	18.3	43.8
2%	70	163	0.75	1.06	830	805	11	31.4
3%	54.4	133	0.73	1.05	775	705	5.4	22.6
5%	34.4	64	0.70	0.9	620	351	3.3	16.6

With the Zn contents increasing, the magnetic properties of isotropic magnets decreased, especially the demagnetization curve rectangularity. However, Hcj increased a little when Zn content was 1%. After hot deformed by SPS, with the Zn contents increasing, Br increased until 2% Zn and then decreased ; $(BH)_m$,Hcj arrived maximum at 2% Zn, which were 163 kJ/m³ and 803 kA/m respectively.

Zn was nonmagnetic phase which deteriorated the magnetic properties. From Fig. 2 and Fig. 3, it can be concluded that a lot of α-Fe appeared after addition of Zn which showed Zn reacted with Nd to form compounds. The proper amount of compounds formed by Nd and Zn together at grain boundaries acted as the Nd-rich phase in the deformation process, so Br and Hcj of deformed magnets increased largely after a little of addition of Zn.

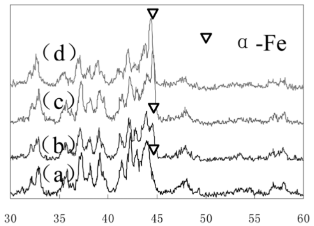

Fig. 2. XRD of magnets with different Zn contents: (a) 0%, (b) 1%, (c) 3%, (d) 5%.

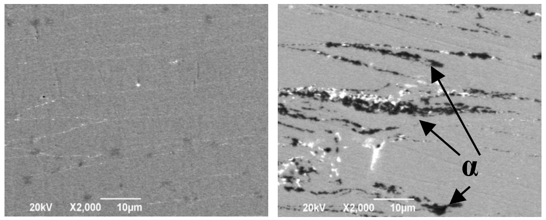

Fig. 3. SEM back scattered micrographs of cross sectional of hot deformed magnets with different Zn addition :(a) 0%, (b) 2%.

BT05

Synthesis and Magnetic Property of Cu doped CoPt-Pt Barcode Nanowires

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Magnetic multilayered (barcode) nanowires are of interest owing to their unique properties, multifunctionality and potential applications in magneto-optic recording, nano-device and biosensing [1]. Especially, CoPt nanostructure prospects for high density recoding media. To achieve desired magnetic property, however, thermal processing is commonly needed at high temperature (>600°C). Based on the previous study on the effect of Cu doping in CoPt alloy nanowires [2], we report here the fabrication and characterization of Cu-doped CoPt-Pt barcode nanowires, synthesized by pulse electrodeposition from a single solution containing Co, Pt and Cu ions in anodic alumina oxide (AAO) nanotemplates. TEM shows that robust nanowires were successfully deposited (Fig. 1a), which possess the expected alternative bilayer nanostructure arrangement (Fig. 1b). For example, single nanowires can have a diameter of 50 nm and the segmental lengths 100 nm and 40 nm for CoPt and Pt layers respectively. TEM-EDX analysis reveals that the Cu-doped CoPt layer has a nominal composition of 66% Co, 22% Pt and 12% Cu in atomic ratio. The multilayered nanowire arrays exhibit a magnetization easy-axis parallel to the nanowire axis (Fig. 1c). In the presentation, the structure-property relation is to be addressed.

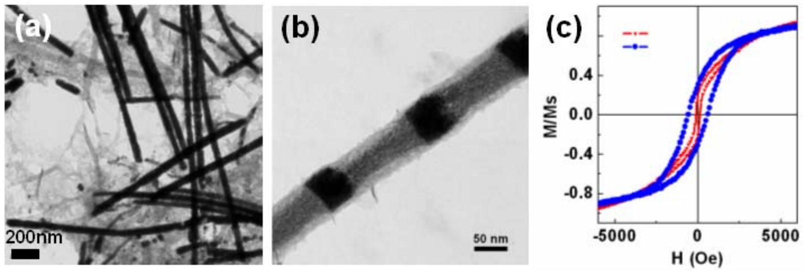

Fig. 1. Electrodeposited Cu doped CoPt/Pt barcode nanowires. (a) TEM morphology, (b) Barcode nanostructure, and (c) Hysteresis curves of the nanoarray.

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REFERENCES

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