RD04

Coercivity and Microstructure of Mn-Ni-N Sintered Alloys

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The compounds containing Mn such as Heusler's alloys, Mn-Al(-C) and IrMn, show interesting magnetic behaviour. In our previous work [1], Mn-Ni-N sintered alloys showed relatively high coercivities. Therefore, the relationship between magnetic properties and microstructure was investigated in this investigation.

The composition of the samples was $Mn_4N_{-x}Ni$ (x = 0-50 at %) and the samples were prepared by the conventional powder metallurgy. The raw powders of Mn4N and Ni were mixed and pressed into cylindrical shapes of f10mm x 10mm at 490MPa. These compacts were sintered at 800-1200 ℃ for 3 h in a nitrogen atmosphere and then slow-cooled or jacket-quenched to room temperature. Magnetic properties were measured by a vibrating sample magnetometer (VSM) and a BH-tracer. Microstructure was observed by XRD, SEM-EDX and TEM.

Figure 1shows the hysteresis loop of the sample heat-treated at 1200 °C for 3 h and then jacket-quenched in a nitrogen atmosphere. This sample exhibits a high coercivity of 352 kA/m. Figure 2 shows the SEM (BSE) images taken from the samples (a) slow-cooled or (b) jacket-quenched from the sintering temperature. Both of the samples consist of two phases with a lamellar structure. The jacket-quenched sample shows smaller lamellar spacing and smaller difference in the contrast between two phases The EDX analysis reveals that the difference of the contrast is due to the Ni content. The TEM observation also reveals that the jacket-quenched sample contains many stacking faults. It is considered that the stacking faults are related to the high coercivity in the jacket-quenched sample.

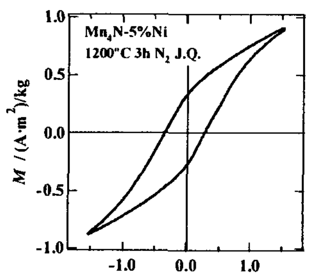

Fig. 1. The hysteresis loop of the Mn_4N-5%Ni alloy heat-treated at 1200 °C for 3h and then jacket-quenched in a nitrogen atmosphere.

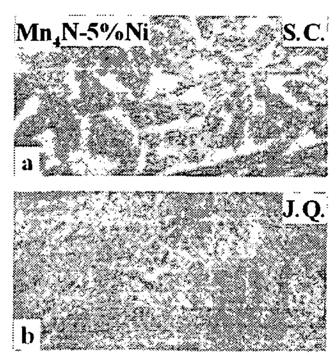

Fig. 2. SEM(BSE) images of the Mn_4N-5%Ni alloys heat-treated at 1200 °C for 3h and then (a)slow-cooled or (b)jacket-quenched in nitrogen.

REFERENCES
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RD05

The Large Low-Field Magnetic Entropy Changes in $Ni_{43}Mn_{46-x}A_xSn_{11}$(A=Co and Cu) Alloys

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Very recently, we reported the large low field magnetic entropy changes in ferromagnetic shape memory alloys (FSMAs) $Ni_{50-x}Mn_{39+x}Sn_{11}$ alloys [1]. It is reported that the martensitic transition (MT) temperatures in FSMAs are relative to the valence electron concentration *e/a* (electrons per atom). In the present paper, a series of $Ni_{43}Mn_{46-x}A_xSn_{11}$ (A=Co and Cu) alloys were prepared by arc melting method. The MT temperatures shift to higher temperature with the increasing Co and Cu concentrations. The isothermal magnetization curves around MT temperatures show the typical metamagnetic behavior. Under a low applied magnetic field of 10 kOe, large magnetic entropy changes around MT temperatures are observed. The origin of the large magnetic entropy changes and the potential application for $Ni_{43}Mn_{46-x}A_xSn_{11}$ (A=Co and Cu) alloys as working substance for magnetic refrigeration have been discussed.

REFERENCE
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