Development of New Functional Alloys with Heusler-type Structure －Their Phase Stability and Physical Properties－

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【Outline of survey】

Recently, our group has found that NiMnIn-based shape memory alloys show a unique magnetic change from paramagnetic to antiferromagnetic accompanying the martensitic transformation from a Heusler-type structure to modulated structures and that magnetic-field-induced shape memory can be obtained at a fixed temperature. We have also recently investigated phase stability and magnetic properties of Co-based Heusler phases and proposed the Co_2CrGa Heusler-type alloy as a promising half-metallic material for use in the tunneling magnetoresistance (TMR) devices.

In the present project, we will examine phase equilibria and some physical properties of the above mentioned Ni and Co-based functional Heusler alloys and clarify the related material properties in order to develop advanced materials for various fields such as magnetic actuators, magnetorefrigerator systems, TMR devices etc.. Combinatorial methods will be applied for the experimental determination of phase diagrams, and thermodynamic analysis on the basis of the experimental data will also be performed.

【Expected results】

From the present project, many kinds of Heusler-type materials, which are expected to be applied for use in magnetic actuators, vibrators, strain sensors, thermomagnetic motors, magnetorefrigerator systems, half-metallic magnets etc., will be developed. In addition, establishment of a combinatorial method will drastically reduce the cost and duration required for experimental determination of a phase diagram. A thermodynamic database available to material design and processing of many Co and Ni-based materials is expected to be successively developed.

【References by the principal researcher】

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• R. Kainuma, K. Oikawa, K. Ishida et al. “Magnetic-field-induced Shape Recovery by Reverse Phase Transformation, **Nature**, 439, (2006) 957-960

【Term of project】 FY2006－2009	【Budget allocation】31,900,000 yen

【Homepage address】 none