

Elastic Diffuse Scattering of Neutrons in Fe₃Pt Invar Alloys

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The ordered Fe₃Pt alloy has an L1₂(Cu₃Au)-type structure, in which the corner sites are occupied by Pt and face center sites by Fe, respectively. However, by thermal treatment, disordered alloy is obtainable. Both ordered and disordered Fe₃Pt alloys are ferromagnetic and exhibit a small negative thermal expansion below the Curie temperature (ordered: $T_C=400\sim 500\text{K}$, disordered: $T_C=280\sim 380\text{K}$), which is well known as the Invar effect as well as Fe₆₅Ni₃₅ alloy. A martensitic phase transformation from fcc to bcc structure occurs at low temperature.

Recently, by the neutron scattering measurement we performed, elastic diffuse scattering with butterfly pattern was observed for typical Invar alloys Fe₆₅Ni₃₅ around the (200) and (002) Bragg peak positions. Since diffuse scattering seems to be strongly related with the Invar effect, we tried to examine existence of diffuse scattering for another Invar alloy Fe₃Pt. Because Fe₃Pt alloy is unstable against the martensitic phase transformation at low temperature, we used Fe₇₂Pt₂₈ alloy in both ordered and disordered specimens. The measurements were performed at the T1-1 triple axis spectrometer installed in the thermal guide of JRR-3M.

Fig. 1 shows elastic diffuse scattering intensity contour map for ordered Fe₇₂Pt₂₈ alloy obtained at room temperature around (002). Diffuse scattering with butterfly pattern is clearly observed. In this figure, sharp ridge (the body of the butterfly) is due to the mosaic spread of the sample. The similar diffuse scattering with butterfly type is also observed for disordered Fe₇₂Pt₂₈ alloy. Diffuse scattering with butterfly type is a characteristic of the local lattice distortion. Since diffuse scattering with special pattern is common for three typical Invar alloys, Fe₆₅Ni₃₅, ordered and dis-

ordered Fe₃Pt alloys, it is very likely that this lattice distortion is related to the Invar effect. There are many things to examine such as temperature dependence, magnetic field dependence, a difference by the degree of atomic order etc. These are remained for future program.

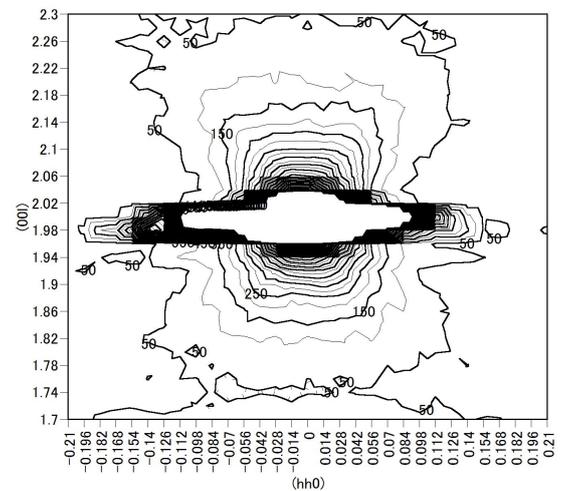


Fig. 1. elastic diffuse scattering intensity contour map for ordered Fe₇₂Pt₂₈ alloy obtained at room temperature around (002)