

Neutron diffraction studies on a Pr₇Ni₃ single crystal

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The rare earth compound Pr₇Ni₃ crystallizes in the hexagonal Th₇Fe₃ type structure with the space group P6₃mc [1]. From the magnetic measurements, it possesses the two magnetically ordered states; one is an antiferromagnetic state between T_N = 4.2 K and T_t = 2.1 K and ferrimagnetic like state below T_t. [2]. In this study, neutron diffraction measurements have been carried out on a Pr₇Ni₃ single crystal in the a* - c* reciprocal plane using the HQR spectrometer of JRR-3M of in the temperature range from 1.5 to 10 K.

Figure 1(a) shows the magnetic and nuclear reflections in the a* - c* reciprocal plane at 1.5 K. The magnetic reflections appear at the positions indexed by the propagation vector $k = (0.5, 0, 0)$. A magnetic reflection was also observed at the nuclear position (1, 0, 0) indicating a small spontaneous magnetization along the c-axis. Ferrimagnetic magnetization curve is also observed at 1.9 K [2]; a canted magnetic structure along the c-axis can be possible.

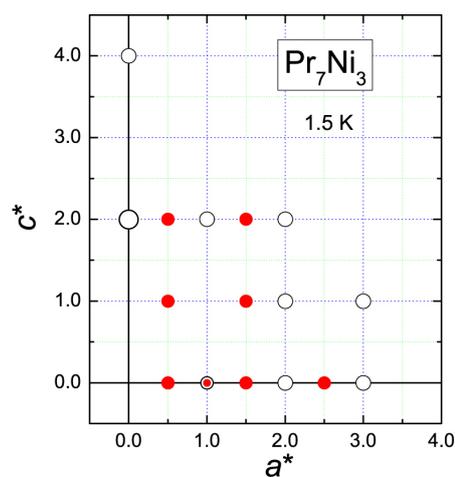
Figure 1(b) shows the intensity of the magnetic reflection at (0.5, 0, 2) and (1, 0, 0) as a function of temperature. The magnetic reflection at (0.5, 0, 2) shows a maximum at T_t and decreases; it disappears around T_N. On the other hand, the ferromagnetic component at (1, 0, 0) disappears at T_t. The k_x was constant up to T_N.

Magnetic structure analysis using a Rietveld method for each state is now in progress.

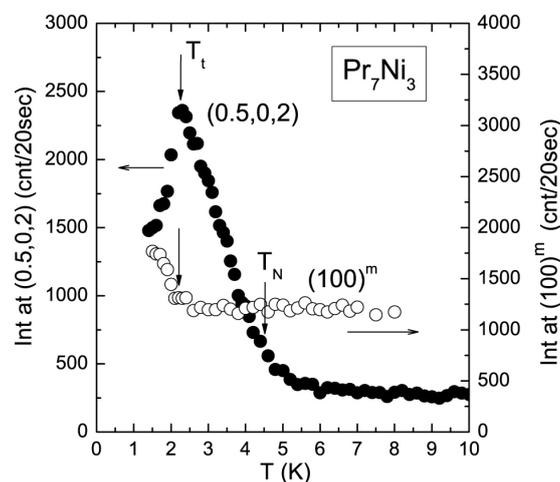
References

[1] G. L. Olcese, J. Less-Common Met. 33 (1973) 71.

[2] Y. Haga et al., Meeting Abstracts of the Phys. Soc. Jpn. 62, 1-3 (2007) 420.



(a)



(b)

Fig. 1. Magnetic and nuclear reflections of a Pr₇Ni₃ single crystal in the a* - c* reciprocal plane at 1.5 K (a). The intensity of (0.5, 0, 2) magnetic reflection and the magnetic component of (1, 0, 0) as a function of temperature (b).