

## Variation of magnetic modulation for the antiferromagnetic states in $\text{CeRh}_{1-x}\text{Co}_x\text{In}_5$ ( $x = 0, 0.5$ and $\sim 0.7$ )

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For a decade, there has been a growing interest in physical property near the quantum critical point (QCP) in the heavy-fermion systems. The heavy-fermion compound  $\text{CeRhIn}_5$  orders in an incommensurate antiferromagnetic (AF) phase with a modulation of  $q_h = (1/2, 1/2, 0.297)$  [1]. It is revealed in the Co-doped alloys  $\text{CeRh}_{1-x}\text{Co}_x\text{In}_5$  [2] that the AF phase is suppressed with increasing  $x$ , and then disappears at  $x_c \sim 0.7$ . At the same time, superconductivity (SC) appears between  $x = 0.4$  and  $x = 1$ . Furthermore, recent elastic neutron scattering experiments for  $\text{CeRh}_{1-x}\text{Co}_x\text{In}_5$  with intermediate Co concentrations [3, 4] revealed that a commensurate magnetic order with a wave vector  $q_c = (1/2, 1/2, 1/2)$  develops at low temperatures. To elucidate the nature of these AF phases, we have performed the neutron scattering experiments for  $\text{CeRh}_{1-x}\text{Co}_x\text{In}_5$  ( $x = 0, = 0.5, \sim 0.7$ ).

Single crystals of  $\text{CeRh}_{1-x}\text{Co}_x\text{In}_5$  were grown by the In-flux method. The samples were shaped into bar (typical size:  $\sim 3 \text{ mm}^2 \times 10 \text{ mm}$ ) in order to minimize the effects of the neutron absorption caused by Rh and In. Elastic neutron scattering experiments were carried out using triple-axis spectrometers GPTAS and PONTA at the JRR-3M research reactor of JAEA. Measurements were performed in the  $(hhl)$  scattering plane.

Figure 1 shows the neutron scattering pattern obtained from the  $(1/2, 1/2, 1 + \zeta)$  ( $0 \leq \zeta \leq 1$ ) scan at 1.6 K. The incommensurate magnetic Bragg peaks were observed for  $x = 0$ , whose wave vector corresponds to  $q_h \sim (1/2, 1/2, 0.297)$ . For  $x = 0.5$ , we observed of the commensurate

magnetic Bragg peak with the modulation of  $q_c = (1/2, 1/2, 1/2)$ . In addition, for  $x \sim 0.7$ , we have found that the  $q_h$  peak position moves toward  $q_1 \sim (1/2, 1/2, 0.42)$ , together with the appearance of the  $q_c$  peak.

From these results, we suggest that the commensurate magnetic correlation is tightly coupled with SC.

### References

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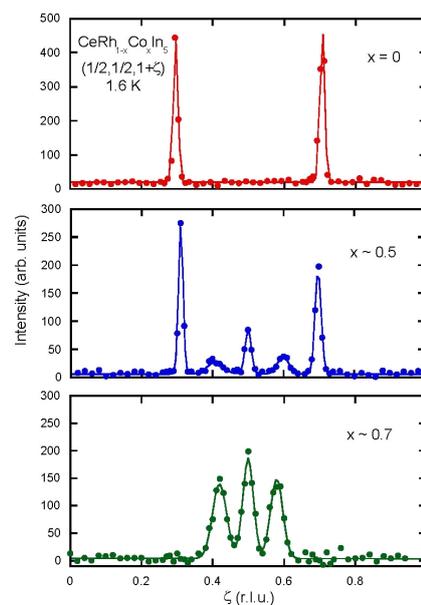


Fig. 1. Antiferromagnetic Bragg-peak profiles at 1.6 K for  $\text{CeRh}_{1-x}\text{Co}_x\text{In}_5$ .