Magnetic excitation in a non-centrosymmetric pressure-induced superconductor $CeRhSi_3$

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Coexistence between magnetism and superconductivity (SC) is the central issue in condensed matter physics. Recently non-centrosymmetric heavy-fermion superconductor $CePt_3Si$ and UIr were reported. From the fundamental point of view of symmetry, the discovery of these materials are very surprising because there are two basic symmetries which are considered indispensable to form Cooper pair: time reversal symmetry and parity. The former is important for Cooper pairing in any case while the latter is mandatory for pairing in the triplet channel. Thus there is a lot of discussions for the non-centrosymmetric SC at present.

Kimura *et al.* [1] discovered another non-centrosymmetric superconductor $CeRhSi_3$ with the crystal structure of $BaNiSn_3$-type ($I4mm$). [2] $CeRhSi_3$ exhibits the antiferromagnetic (AFM) ordering below $T_N = 1.6$ K at ambient pressure (P). By increasing the P, T_N shows a maximum around 0.7 GPa, then gradually decreases. SC appears in a wide P range from 1.2 to 2.3 GPa (and more). Concerning the magnetic structure, there was only one neutron diffraction work on polycrystalline samples, [3] which exhibits no magnetic reflections with possible maximum magnetic moment of 0.25 μ_B/Ce. In the last year we have first determined the magnetic structure using the single crystalline $CeRhSi_3$, [5] indicating the longitudinal spin density wave (LSDW) with the wave vector of k = (0.215, 0, 0.5) and the Ce staggered moment of $\sim$ 0.1 μ_B/Ce.

This year we tried to examine the low-energy magnetic excitations below $T_N = 1.6$ K. Figure 1 shows the inelastic scattering profile at Q = (0.215, 0, 1.5) and T = 0.76 K obtained at the HER spectrometer with the fixed energy of $k_f = 1.55$ $\AA^{-1}$ using the horizontally focused analyzer. One can recognize an energy-broad magnetic signal at the energy loss side, which is almost wave vector independent. Thus we did not observe any signal corresponding to the LSDW ordering wave vector. We will plan to go to the lower energy in the next.

References

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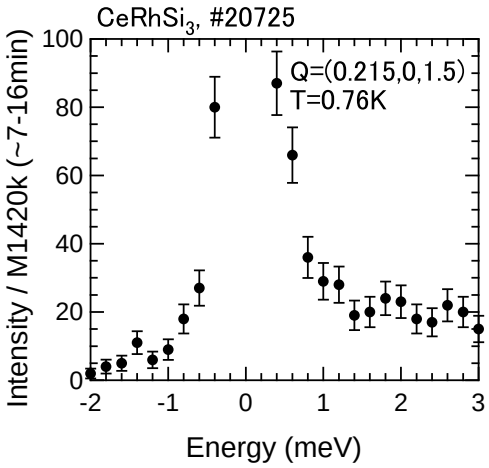

Fig. 1. Inelastic neutron scattering profile at Q = (0.215, 0, 0.5).