The elemental substitution study of quantum materials $YbCu_4T$

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Recently, the exploration of materials exhibiting quantum criticality has been actively attracted. Near quantum critical points, the emergence of exotic quantum phases due to large spin fluctuations can occur. However, a quantum criticality often observed under high pressure or high magnetic fields.

Recently, we have been studying $YbCu_4Ni$ [1], which exhibits quantum criticality at zero magnetic field and ambient pressure, and $YbCu_4Au$ [2], which shows quantum criticality at 1 T. By powder neutron diffraction experiments at HERMES, we found that the crystal structure of $YbCu_4Ni$ has site mixing, a

structure different from what had been previously proposed in Yb1-4-1 family. Thus, we performed same powder diffraction experiments on $YbCu_4Au$ to confirm the crystal structure.

The sample was synthesized by the method described in reference [5]. The obtained single crystals were crushed to obtain total of 2 g. The powder was sealed in a vanadium cell with helium gas. The experiments were performed at the T1-3 HERMES beamline using a ^{4}He refrigerator and cooled down to 3 K.

Figure 1 shows the powder neutron diffraction pattern of $YbCu_4Au$ at 3 K. We performed Rietveld analysis and determined the crystal structure as shown in the inset. The crystal parameters are listed in Table I. This structure is different from that of $YbCu_4Ni$.

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[1] K. Osato, T. Taniguchi* *et al.*, Phys. Rev. B. **109**, 024435 (2024).
[2] T. Taniguchi *et al.*, submitted.

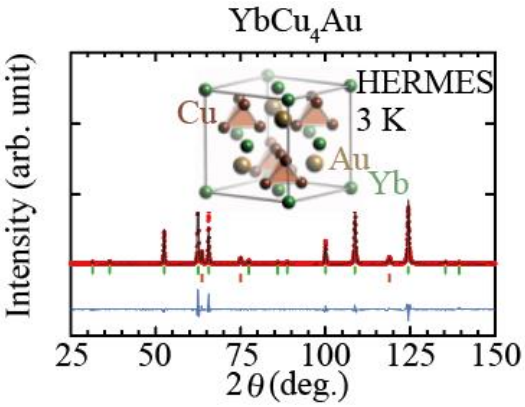

Fig. 1. Powder neutron diffraction patterns of $YbCu_4Au$ at HERMES [2].

Table I. Crystal parameters of $YbCu_4Au$.

atom	site	x	y	z
Yb	4a	0	0	0
Cu	16e	0.62364	0.62364	0.62364
Au	4c	1/4	1/4	1/4