

(※本報告書は英語で記述してください。ただし、産業利用課題として採択されている方は日本語で記述していただいても結構です。)

 MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2016A0110 実験課題名 Title of experiment 実験責任者名 Name of principal investigator Kenji Ohoyama 所属 Affiliation Ibaraki University	装置責任者 Name of responsible person T. Ishigaki 装置名 Name of Instrument/(BL No.) BL20 実施日 Date of Experiment 2016/6/22-24

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。(適宜、図表添付のこと)
 Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.
Rare earth compound Yb ₅ Ge ₄ powder sample

2. 実験方法及び結果 (実験がうまくいかなかった場合、その理由を記述してください。)
Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.
<p>We performed a neutron powder diffraction experiment on BL20 for magnetic structure refinement of Yb₅Ge₄, which reveals a phase transition at $T=1.7$ K. Since the anomaly of magnetic susceptibility at $T=1.7$ K is not obvious, the origin of the phase transition is not clear at the moment. To confirm the origin of the phase transition, we measured powder patterns at $T=0.56$ K and 2 K and 10 K using 1K Cryo of BL20. The powder sample was sealed in a standard vanadium cell with a diameter of 6 mm. We successfully observed magnetic reflections at $T=0.56$ K, directly meaning that the phase transition at $T=1.7$ K is a magnetic ordering, because no structural change was observed in the data. We analyzed the powder patterns using the Rietveld analysis program Fullprof. Using the representation analysis method, we succeeded in finding the unique model which represent the powder patterns and the magnetic anisotropy. The important point of the results of the analysis is that Yb atoms locate at a 8d site have magnetic moments, while others 12 Yb atoms in the unit cell are divalent. This is quite consistent with the previous studies.</p>

2. 実験方法及び結果(つづき) Experimental method and results (continued)

Note that the Yb atoms locate at a 8d cite forms a kind of ladders; the distance between Yb atoms in a ladder is shorter than that between Yb in neighboring ladders, suggesting that the low dimensional magnetic properties may be expected under some conditions. In comparison with 3d magnetic materials, low dimensional magnetism is quite rare in the 4f system. Thus, Yb₅Ge₄ may be a new material which shows exotic magnetism.