


実験報告書様式(一般利用課題・成果公開利用)

(※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。)

	承認日 Date of Approval 2015/3/30 承認者 Approver 大原 高志 提出日 Date of Report 2015/3/27
課題番号 Project No.2014B0106 実験課題名 Title of experiment Magnetic Structure Analysis of a Chiral Magnet Ba ₃ Fe ₂ O ₅ Cl ₂ 実験責任者名 Name of principal investigator Taka-hisa Arima 所属 Affiliation University of Tokyo	装置責任者 Name of Instrument scientist Takashi Ohara 装置名 Name of Instrument/(BL No.) SENJU/BL-18 実施日 Date of Experiment From 18 Dec. 2014 to 21 Dec. 2014

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.
A single crystal of Ba ₃ Fe ₂ O ₅ Cl ₂ .

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>Ba₃Fe₂O₅Cl₂ is known to belong the chiral and cubic space group I₂13 at room temperature. It shows an insulating behavior. A magnetization measurement performed in prior to the neutron measurement has shown that the compound exhibits weak spontaneous magnetization below about 140 K. To reveal the nature of the magnetic transition, a large single crystal was grown by a floating zone method (see Fig. 1) and a neutron diffraction measurement was performed at low temperatures by using SENJU. The intensity data were collected at 200 K and 30 K, and following two results were obtained.</p> <p>1. Reflections of (hkl) with odd h+k+l were observed both at 200 K and 30 K. Such reflections do not satisfy the reflection condition of the space group of I₂13. The reflections with odd h+k+l decrease in intensity, as shown in Fig. 2. This result indicates that this compound undergoes an antiferromagnetic transition above room temperature.</p>

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

2. It has been found that the difference in intensity of magnetic reflections between 200 K and 30 K is not large. On the other hand, our single-crystal synchrotron-x-ray diffraction measurement shows that the compound exhibits a structural phase transition at about 140 K. It is likely the structural change would give rise to the tiny canting of Fe moments, resulting in the weak ferromagnetic moment.



Fig. 1: Single crystal for the neutron diffraction measurement on BL-18.

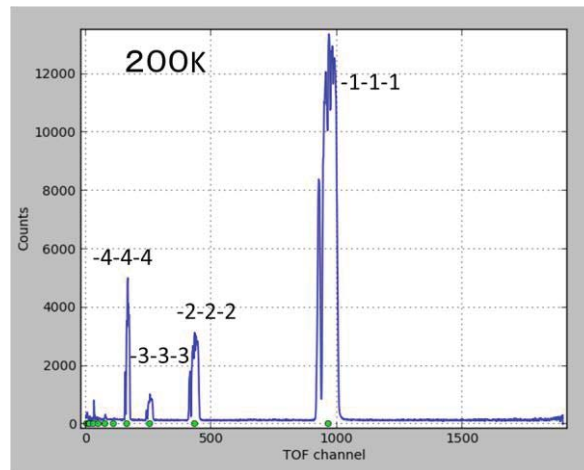


Fig. 2: Time-of-flight profile along (111) of a chiral magnet $\text{Ba}_3\text{Fe}_2\text{O}_5\text{Cl}_2$ at 200 K, obtained on BL-18.