| MLF Experimental Report | 提出日 Date of Report<br>2013/10/13 |
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| 課題番号 Project No.<br>2013A0158<br>実験課題名 Title of experiment<br>Magnetic Structure of Ni-Oxides with Honeycomb Lattice<br>実験責任者名 Name of principal investigator<br>Yasui, Yukio<br>所属 Affiliation<br>Meiji University | 装置責任者 Name of responsible person<br>Ishigaki, Toru<br>装置名 Name of Instrument/（BL No.）<br>iMateria (BL-20)<br>実施日 Date of Experiment<br>2013/5/14 |

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.

NdCrTiO5

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.

We have investigated the magnetic behavior of $NdCrTiO_5$, which exhibits an antiferromagnetic transition at $T_N$=21 K. Although the magnetic structure of $NdCrTiO_5$ at 4.2 K was reported by Buissonfrom using the neutron diffraction analysis [1], the temperature dependence of order parameters of both the $Nd^{3+}$-moments and $Cr^{3+}$-ones is not understood. Then, the neutron diffraction measurements have been carried out on powder samples of $NdCrTiO_5$ by using neutron diffractometer (iMateria) in order to understand whether the *T*-dependence of both $Nd^{3+}$- and $Cr^{3+}$-order parameters is the same. Note that unfortunately, we were able to experiment on only a part, because of beam damp during the measurements.

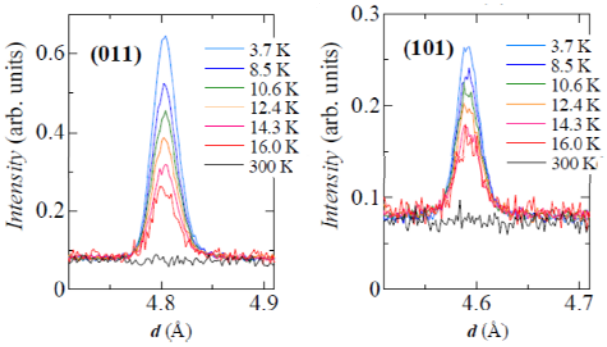


Fig. 1: Profiles of the neutron diffraction for 011 and 101 reflections of $NdCrTiO_5$ taken at various temperatures.

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

We show examples of neutron diffraction profiles in Fig. 1, which is 011 and 101 reflections of $NdCrTiO_5$ taken at various temperatures. We can see the growth of intensities of the magnetic reflections. Figure 2 shows the magnetic ordering pattern which can reproduce the observed magnetic scattering intensities of $NdCrTiO_5$ taken at 3.7 K. The obtained magnetic structure is almost consistent with the reported structure in Ref. 1. The $Cr^{3+}$-moments align parallel to the *c* axis (collinear). The $Nd^{3+}$-moments align along the direction which deviates from the *b* axis towards the *a* axis by the angle ~15 °. The temperature dependence of integrated intensities for 011 and 101 magnetic reflections is shown in Fig. 3, where 011 and 101 magnetic reflections have large contribution from the $Nd^{3+}$- and $Cr^{3+}$- moments, respectively. Although the integrated intensities data is limited in the temperature region $T < 16$ K, we can see that the *T*-dependence of both $Nd^{3+}$- and $Cr^{3+}$- order parameters is the same as shown in Fig. 3. This result indicates that the $Nd^{3+}$-moments is strongly related with the $Cr^{3+}$-moments.

[1] G. Buisson, J. Phys. Chem. Solids **31** (1970) 1171.

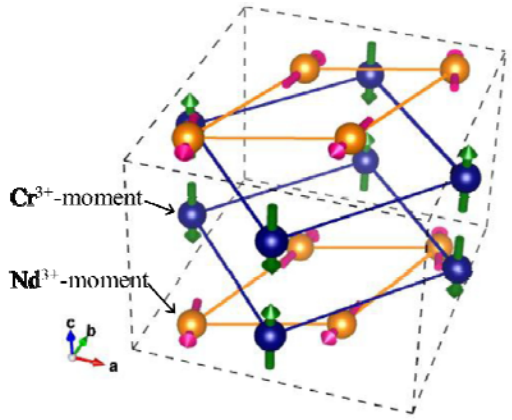


Fig. 2: The magnetic ordering pattern which can reproduce the observed magnetic scattering intensities of $NdCrTiO_5$ taken at 3.7 K. The obtained magnetic structure is almost consistent with the reported structure in Ref. 1.

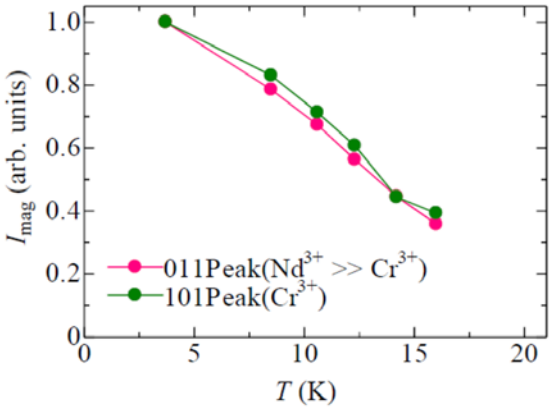


Fig. 3: Temperature dependence of integrated intensities for 011 and 101 magnetic reflections of $NdCrTiO_5$.