


(※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 2011/07/03
課題番号 Project No. 2010B0020 実験課題名 Title of experiment Structural study on novel pyrochlore-type oxides showing metal-insulator transition 実験責任者名 Name of principal investigator Ayako Yamamoto 所属 Affiliation RIKEN	装置責任者 Name of responsible person Takashi TAMIYAMA 装置名 Name of Instrument/(BL No.) BL-08 実施日 Date of Experiment 2010/12/10-12/12

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.
$\text{Hg}_2\text{Ru}_2\text{O}_7$, metal-insulator transition at 107 K, pyrochlore-type structure with frustrated lattice

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 loaded the sample into vanadium cell (thinnest diameter) in a gloved box. Diffraction data of $\text{Hg}_2\text{Ru}_2\text{O}_7$ was successfully collected at room temperature and 70 K (by using refrigerator).

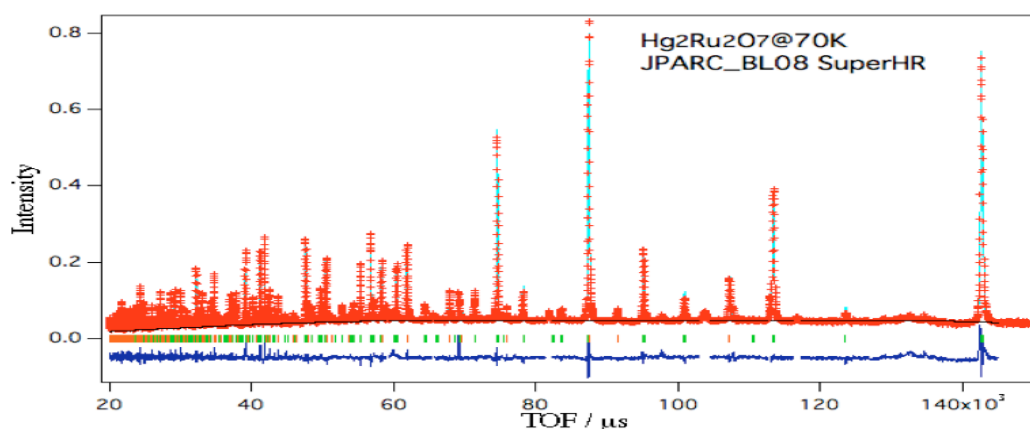


Fig 1 Diffraction and fitting patterns of $\text{Hg}_2\text{Ru}_2\text{O}_7$ at 70 K.

Position of oxygen in LT phase was firstly refined by the high-resolution neutron diffraction data.

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

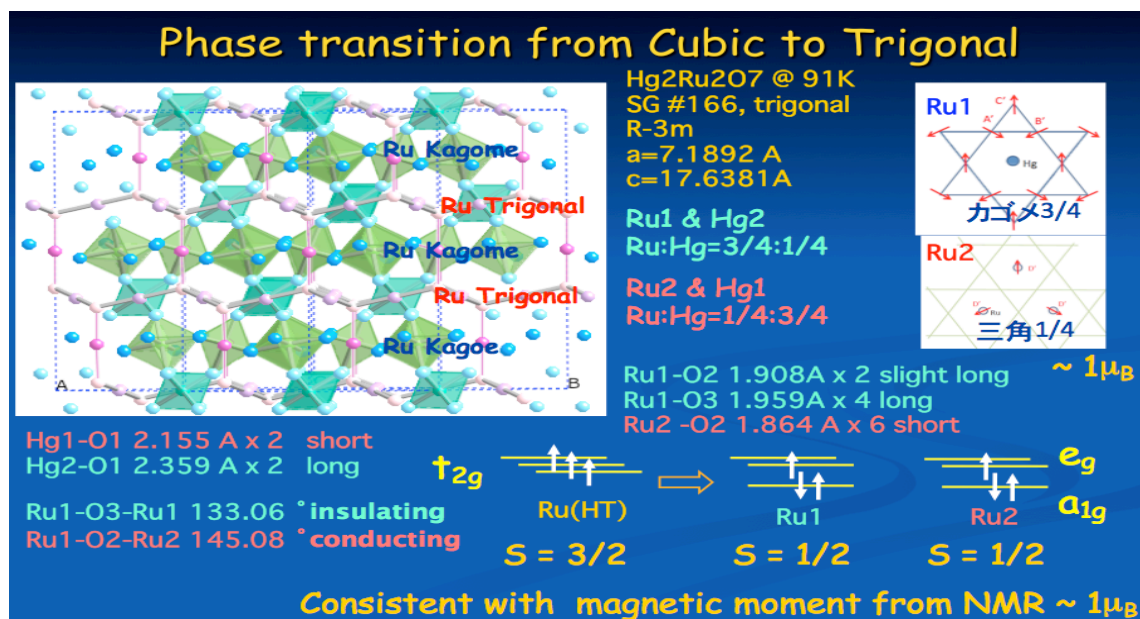


Fig. 2 Schematic figures and bond distances of low temperature phase of Hg₂Ru₂O₇.

The structural distortion and physical properties was consistent with the analysis of the data, suggesting t_{2g} orbitals of Ru split one a_{1g} and two e_g orbitals. Consequently, the apparent magnetic moment suppressed by the transition as shown in Fig 2.

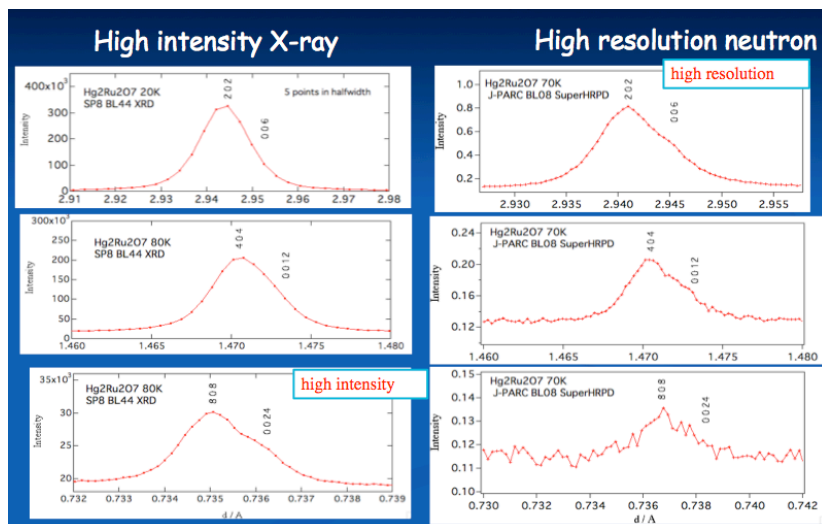


Fig. 3 Comparison between synchrotron XRD (at SP8) and high resolution ND (at J-PARC) in Hg₂Ru₂O₇ with very small distortion.

By this experiment and analysis we could be detected very small distortion that is very difficult to find the split peaks. As shown in Fig.3, even by synchrotron XRD at SP8 the peak split is not cleared. However, High-resolution neutron enables us to distinguish the peak split, especially in large d -region.