


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。)

 <b>MLF Experimental Report</b>	提出日 Date of Report
課題番号 Project No. 2012B0198 実験課題名 Title of experiment Structural study of high refractive index Samarium Titanate glasses 実験責任者名 Name of principal investigator Arai Yasutomo 所属 Affiliation JAXA	装置責任者 Name of responsible person Toshiya Otomo 装置名 Name of Instrument/(BL No.) BL-21(NOVA) 実施日 Date of Experiment Dec. 2012

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.
1 ) (154)Sm <sub>4</sub> (47-nut)Ti <sub>9</sub> O <sub>24</sub> glass sample 2 ) (152)Sm <sub>4</sub> Ti <sub>9</sub> O <sub>24</sub> glass sample 3 ) (154)Sm <sub>4</sub> Ti <sub>9</sub> O <sub>24</sub> glass sample 4) empty cell (Standard vanadium can)

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>The diffraction experiments have been performed on the NOVA of the J-PARC Facility, JAPAN. The spherical glass samples with ca. 2mm in diameters were processed by aerodynamic levitation furnace. The 20 glass samples in a standard vanadium can with 4mm in diameter for each glass concentrations have been used for the neutron diffraction experiments at room temperature. The neutron beam height was adjusted ca. 20mm around the vanadium can. The data collection duration of the neutron diffraction runs were 7 hours. In addition, the empty can was for 3 hours for data collection.</p> <p>Effective densities in the vanadium cans containing the glass samples, for example 2.3 g/cm<sup>3</sup> for <sup>154</sup>Sm<sub>4</sub>Ti<sub>9</sub>O<sub>24</sub> glass, which need to correlate the scattering intensities were calculated by the total vanadium can weighs and the can volume. That density is smaller than the true densities of bulk glass samples.</p> <p>There was no Bragg peak in the observed neutron diffraction spectra, which indicating that the prepared glass samples were fully glass (no crystallized glass). There are a number of neutron diffraction experiments using <sup>154</sup>Sm contain materials. We used the high purity <sup>154</sup>Sm (99.9%) oxides for preparing the <sup>154</sup>-Sm<sub>4</sub>Ti<sub>9</sub>O<sub>24</sub> glass samples. At present, the smooth and no Bragg peak structure factor of the <sup>154</sup>-Sm<sub>4</sub>Ti<sub>9</sub>O<sub>24</sub> glass have been obtained from 1.5 to 25 Å<sup>-1</sup>. The <sup>149</sup>Sm atom shows a strong resonance at 0.098eV of the neutron cross section.</p>

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

Since we prepared 152-Sm4Ti9O24 glass using 98.7% purity 152-Sm oxides, the intensity of the structure factor  $S(Q)$  of that glass at high  $Q$  regions have been increased. The Ti atom cross section of (154)Sm4(46-nut)Ti9O24 glass is set to be zero because we prepared the glass sample by utilizing the cross section difference between 46-Ti (4.93) and nut-Ti (-3.438). The smooth structure factor of the (154)Sm4(46-nut)Ti9O24 glass was obtained from 1.5 to 25Å<sup>-1</sup>.

The following figure is the structure factors of the 152-Sm4Ti9O24 glass (0.3 Å<sup>-1</sup> <  $Q$  < 10 Å<sup>-1</sup>).

