 MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2012A0101 実験課題名 Title of experiment Effect of N ₂ -annealing in magnetic superconductor FeSr ₂ YCu ₂ O _{6+δ} 実験責任者名 Name of principal investigator Takashi Mochiku 所属 Affiliation National Institute for Materials Science	装置責任者 Name of responsible person Toru Ishigaki 装置名 Name of Instrument/(BL No.) BL20 iMATERIA 実施日 Date of Experiment from April 17, 2012 to April 18, 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.

<p>1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.</p> <p>We measured the six samples of the FeSr₂YCu₂O_{6+δ} magnetic superconductor, which were annealed in N₂ at 720, 740, 760, 780, 800 and 820°C before the O₂-annealing, respectively. The superconducting transition temperature, T_c, is dependent on the N₂-annealing temperature although these samples have the same oxygen content, 6+δ. The sample N₂-annealed at 780°C has the highest T_c, and the T_c value decreases when the N₂-annealing temperature is below or above 780°C.</p>

<p>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。)</p> <p>Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.</p> <p>We have taken the TOF diffraction data for all samples in the double frame operation at room temperature. The data of the all sample were analyzed using the Rietveld refinement program Z-Rietveld on the basis of the tetragonal Ba₂YCu₃O_{6+δ}-type structure model (space group $P4/mmm$). In the refinement, four site were assigned for Cu and Fe: 1a site for Cu(1) and Fe(1) on the magnetic layer, and 2g site for Cu(2) and Fe(2) on the superconducting layer, and the occupation factors of those sites were refined under the constraint of the stoichiometric composition. Figure 1 shows the refinement pattern of the typical sample. Though the samples have the atomic order of Cu and Fe along the <i>c</i>-axis, the occupation of Cu is dependent on the N₂-annealing temperature (see Fig. 2). It indicates that the slight disorder of Cu and Fe deteriorates the T_c value because the oxygen content, 6+δ, is independent on the N₂-annealing temperature.</p>
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2. 実験方法及び結果(つづき) Experimental method and results (continued)

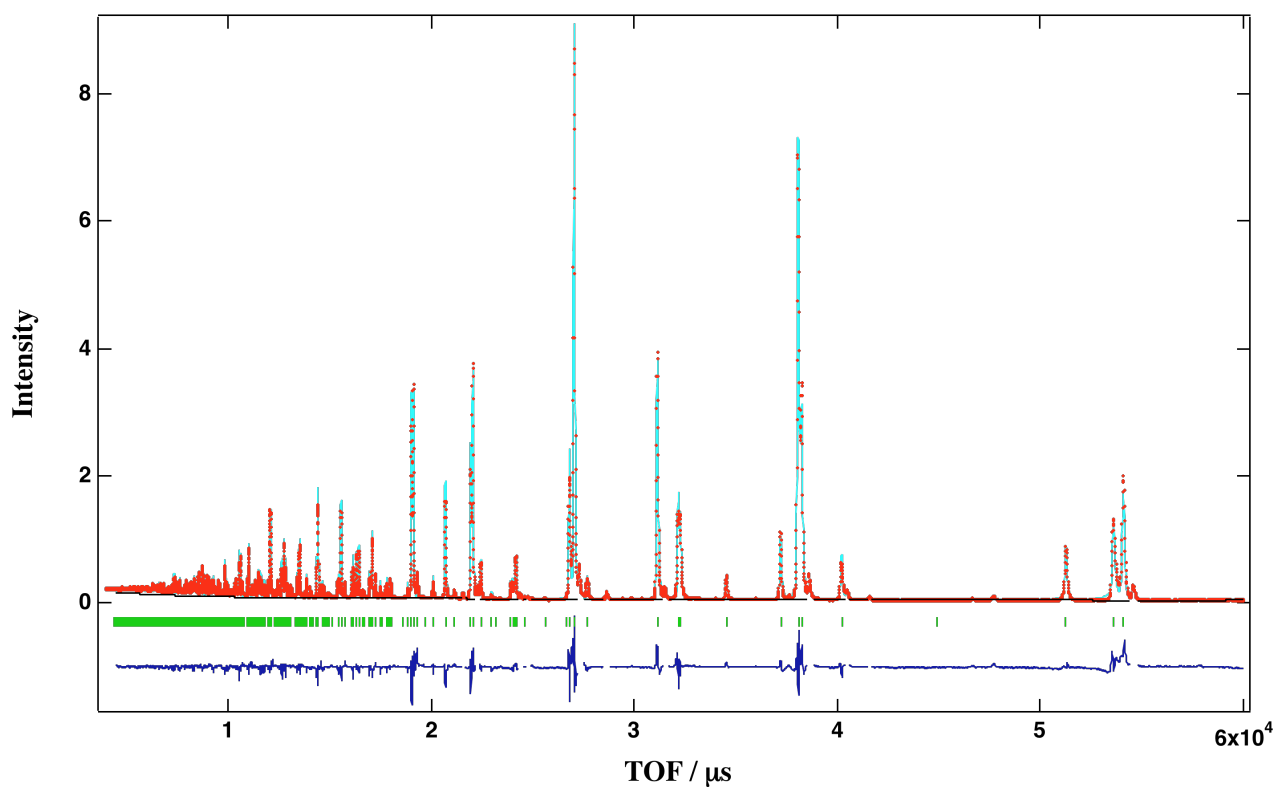


Figure 1. Rietveld refinement pattern for the sample N₂-annealed at 780°C.

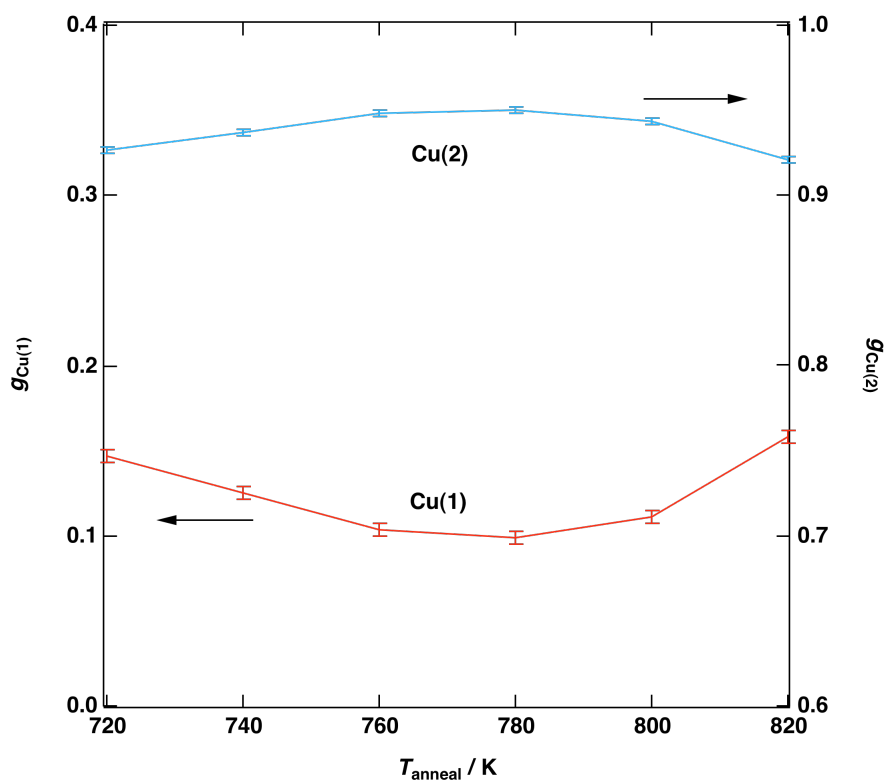


Figure 2. Dependence on the N₂-annealing temperature of the occupation factors of Cu at the Cu(1) and Cu(2) sites, $g_{\text{Cu}(1)}$ and $g_{\text{Cu}(2)}$.