MLF Experimental Report	提出日 Date of Report 2014/06/30
課題番号 Project No. 2014A0209 実験課題名 Title of experiment Role of oxygen in superconducting mechanism for T'-structured cuprate oxide 実験責任者名 Name of principal investigator 藤田全基 所属 Affiliation 東北大学	装置責任者 Name of Instrument scientist 神山 崇, 鳥居 周輝 装置名 Name of Instrument/(BL No.) SuperHRPD BL08 実施日 Date of Experiment 2014 4/24-30

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.

Pr2CuO4(as-grown, annealed)
Pr1.94Ce0.06CuO4(as-grown, annealed)
Pr1.88Ce0.12CuO4(as-grown, annealed)
Pr1.82Ce0.18CuO4(as-grown, annealed)

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.

Experimental method

We performed powder neutron diffraction measurements on Pr2CuO4 (as-grown, annealed) and Pr1.82Ce0.18CuO4 (as-grown) sample at several temperatures (20, 60, 100, 150, 175, 200, 225, 260 and 300K) to determine the crystal structure. The diffraction pattern for Pr1.94Ce0.06CuO4 and Pr1.88Ce0.12CuO4 was measured at the room temperature.

Experimental Results

Figure 1 shows diffraction pattern of as-grown and annealed Pr2CuO4, which is parent compound of electron-doped high-Tc superconductor. Oxygen content could be reduced by annealing and the value was estimated to be ~0.06 from the weight loss of the sample. To determine the occupancy of oxygen at the in-plane site and the opical site, we we analyzed the data by using Rietveld method. Although the R-factor is less than 2%, meaning that the structural parameters are accurately defined, the preliminary analysis showed

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

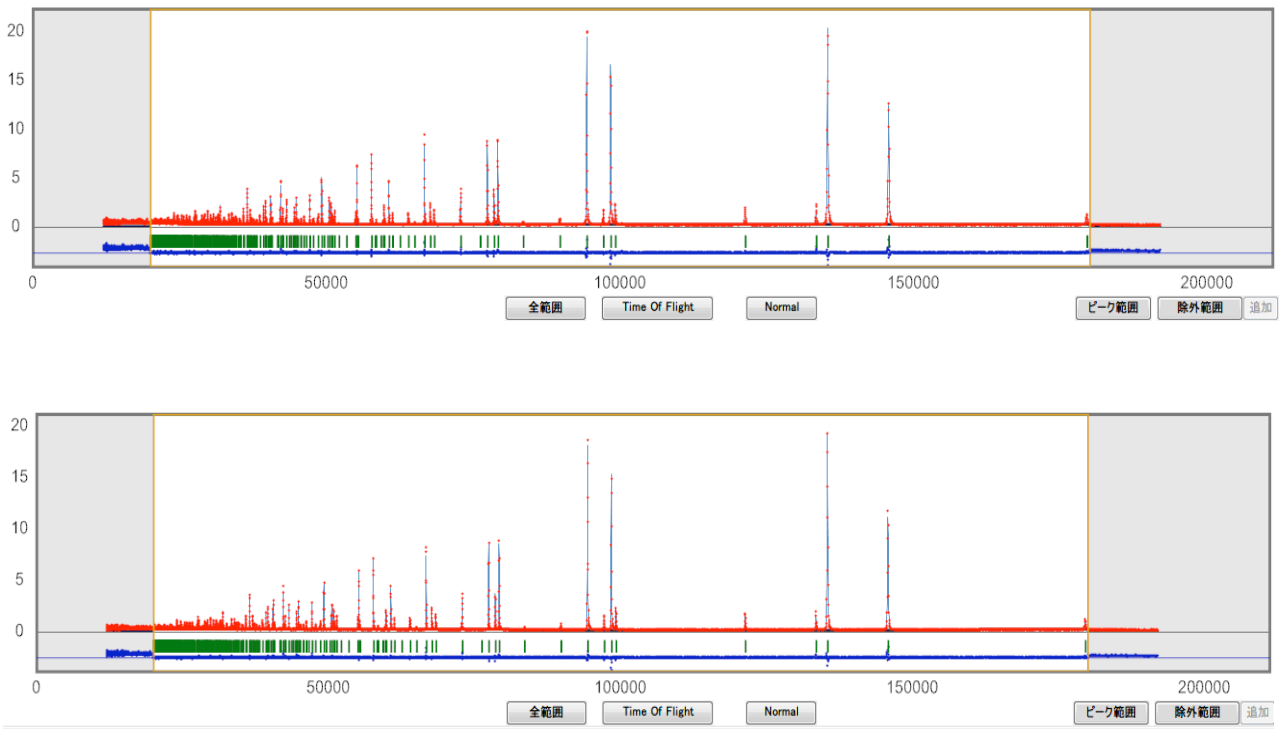

Figure 1：powder diffraction at room temperatures, upper figure: Pr2CuO4 as-grown, lower figure: Pr2CuO4 annealed.

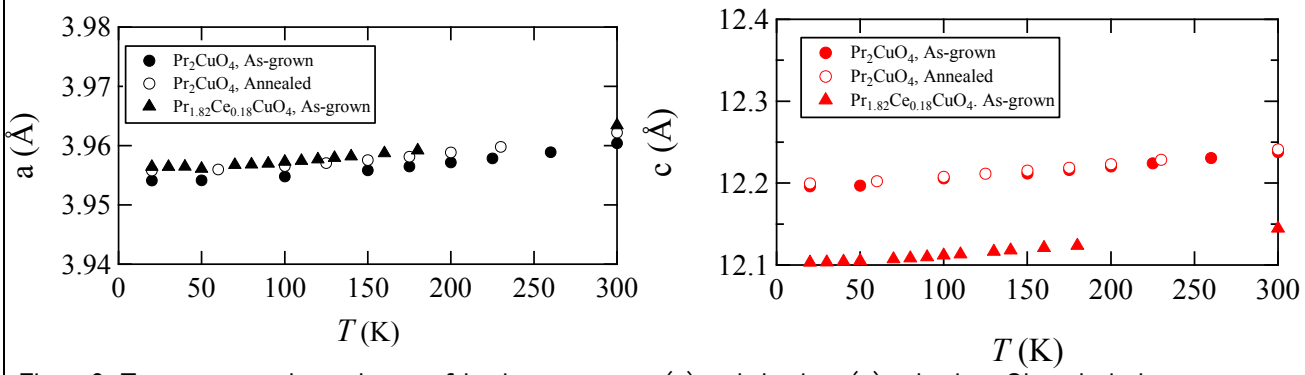

Figure2: Temperature dependence of lattice constant. (a) a、b lattice. (c) c lattice. Closed circle represents Pr2CuO4 as-grown. Open circle represents annealed. Closed triangle represents Pr1.82Ce0.18 as-grown.

a negligible difference in the occupancy rate at each site.

In Fig. 2, the temperature dependence of lattice constant is shown for as-grown and annealed Pr2CuO4. The result for as-grown Pr1.82Ce0.18CuO4 is also plotted in the figures. The in-plane lattice constant in these samples is almost same, while out-of-plane constant constant is larger in the Ce-free samples. This trend is consistent with the previously reported results for Pr2-xCexCuO4. We are now analyzing oxygen content in the Ce-doped samples.