 MLF Experimental Report	提出日 Date of Report 2014/09/21
課題番号 Project No. 2010B0055 実験課題名 Title of experiment Low-energy excitations of glassy carbon tetrachloride prepared by low-temperature vapor-deposition 実験責任者名 Name of principal investigator Osamu Yamamuro 所属 Affiliation Institute for Solid State Physics, University of Tokyo	装置責任者 Name of responsible person Kenji Nakajima 装置名 Name of Instrument/(BL No.) BL14 実施日 Date of Experiment 2011/01/21 ~ 2011/01/28

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.
Carbon tetrachloride (CCl ₄)

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 main purpose of the present study is to clarify the Q-dependence of the boson peak of simple molecular glasses. We have succeeded to obtain a glassy state of CCl₄ by means of a vapor-deposition method with a cryostat designed for this experiment. The data were taken for vapor-deposited glasses (as-deposited and annealed at 50 K) and a crystalline sample prepared by annealing the glassy sample at 80 K. An E_i set of 6.92 meV, 15.1 meV, and 55.7 meV was chosen in the measurement. The duration for a measurement was ca. 8 hours. Figure 1 shows the $S(Q, \Delta E)$ maps at $E_i = 6.92$ meV for the three states of CCl₄. Figure 2 shows the plot as functions of energy. Here, $S(Q, \Delta E)$ are integrated by Q over a range between $Q = 2$ and 2.5 \AA^{-1}. An boson peak with a peak top around 2 meV was clearly observed. No annealing effect was detected. This may be because the as deposited sample was accidentally heated when the vapor-deposition tube was removed before the measurement. Figure 3 shows the $S(Q, \Delta E)$ map at $E_i = 15.1$ meV, that is most important E_i to investigate the Q-dependence of the boson peak up to 4.5 \AA^{-1}. However, unfortunately, the boson peak was not clearly observed because of the energy resolution problem. To obtain a reasonable energy resolution (ca. 1 meV) and maximum Q value, we have to choose more difficult conditions, e.g., 300 Hz, 1 mm-slit. In this condition, it takes more than 2</p>

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

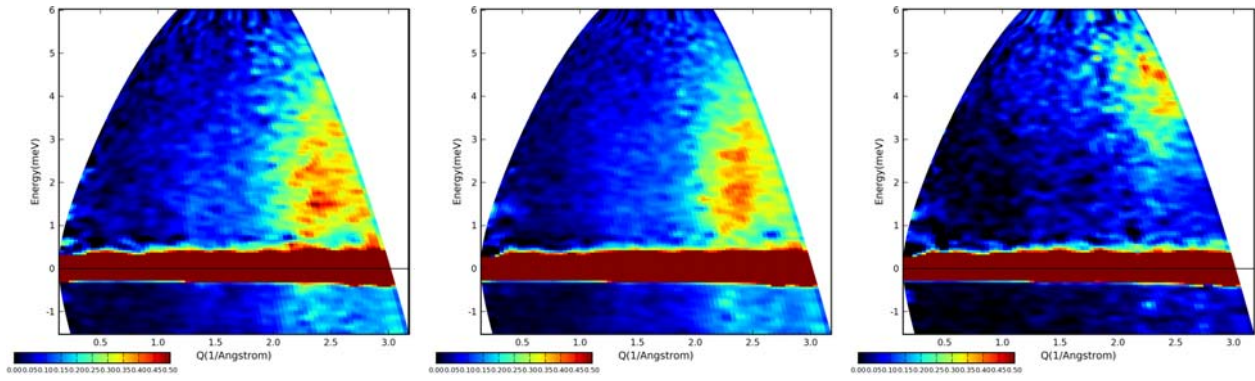


Figure 1: $S(Q, \Delta E)$ map of as-deposited glassy, 50K-annealed glassy, and crystalline CCl_4 . The E_i of the measurement is 6.92 meV.

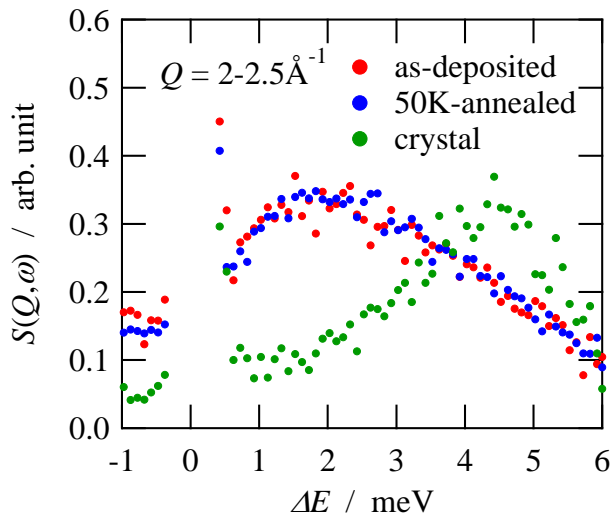


Figure 2: $S(Q, \Delta E)$ of as-deposited glassy, 50K-annealed glassy, and crystalline CCl_4 as functions of ΔE . The E_i of the measurement is 6.92 meV.

