CROSS TOKAI Experimental Report J-PARC	提出日 Date of Report 2013/6/28
課題番号 Project No. 2012A0136 実験課題名 Title of experiment Double differential cross section measurements of hydrogenous materials for advanced moderator development 実験責任者名 Name of principal investigator Masahide Harada 所属 Affiliation JAEA	装置責任者 Name of Instrument scientist Ryoichi Kajimoto 装置名 Name of Instrument/（BL No.） BL01 4SEASONS 実施日 Date of Experiment 2012/06/26 10:00 – 2012/6/28 10:00

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, Light water (H_2O, liquid)
2, Heavy water (D_2O, liquid)
3, Polyethylene (CH2, solid)

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.

In order to estimate a scattering kernel of a hydrogenous material, this experiment was performed at BL01, 4SEASONS. Samples mentioned in the Section “Sample” were enclosed into aluminum case and were set at the sample position of BL01. Also to study temperature dependence of scattering reactions at the sample, the temperatures of samples were set to be 280K, 300K and 320K. Nine incident neutron energies, 309, 96.8, 46.7, 27.4, 18.0, 12.7, 9.9, 4.9 and 2.9meV,were selected by optical devices equipped in BL01.

Figure 1 shows neutron TOF spectra in case with samples (polyethylene, light water and heavy water) and without sample at 300K in the sample temperature. Although experimental data were taken in all detectors equipped in BL01, the data measured by only one detector (PSD number 4) were shown in the figure. Nine peaks corresponding to the elastic scattering of each incident neutron and components around peaks corresponding to up-scattering and down-scattering inelastic scattering can be observed.

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

Thermal neutron energy with thermal equilibrium states of infinite medium at 300K is 25.9meV. Therefore, when the incident energy is higher than 25.9 meV, down-scattering is dominant as the inelastic scattering. On the other hand, when the incident energy is lower than 25.9 meV, up-scattering is dominant.

Figure 2 shows converted data of the experimental data to the outgoing energy spectrum from the samples to the PSD #4 at 96.8, 27.44 and 12.74 meV of the incident energy. In all cases, the elastic scattering peaks and the Maxwell distribution around 50 meV can be seen. Though the Maxwell distributions in cases with the H_2O and the polyethylene samples are very similar, those in cases with the D_2O one and the H_2O one are different. The reason is the different cross section between hydrogen and deuterium.

In the next step, we will convert the experimental data to the scattering data in function of incident energy, emitted energy and polar angle. Finally, we will obtain experimental double differential cross sections of H_2O and D_2O with induced neutrons.

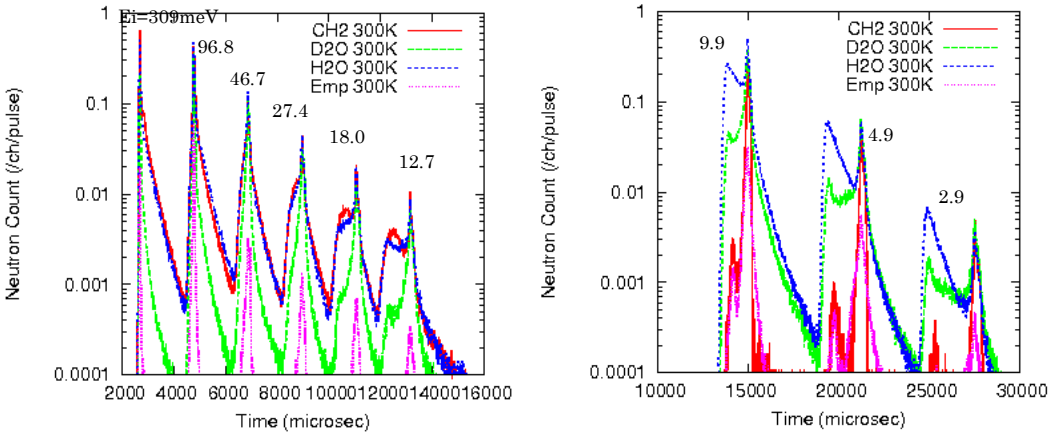

Figure 1: Neutron TOF spectra measured at PSD detector #4.

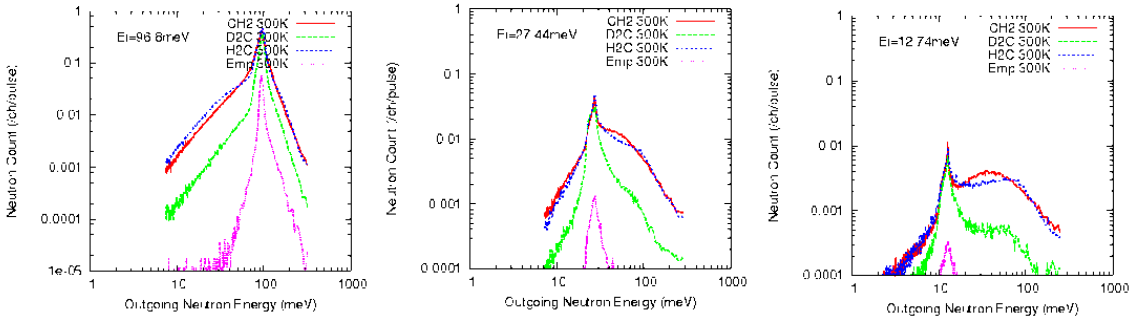

Figure 2: Outgoing neutron energy spectra measured at PSD detector #4.