CROSS TOKAI **Experimental Report** J-PARC

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実験装置名／BL番号 Name of Instrument/BL: 4SEASONS/BL01

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1．研究成果概要 （a）装置グループ内の成果、（b）ユーザー課題実装時における特筆すべきサポート、（c）ユーザー課題の執行状況について、まとめてください。A4 サイズ用紙使用のこと。

Outline of your activities. Following results at your instrument should be reported in A4 size papers: (a) results of your instrument group, (b) significant user support works, and (c) statistical summary of user experiments.

(a) Results of our instrument group

We could perform several test measurements to improve the performance of 4SEASONS although the J-PARC shutdown due to the Hadron accident caused big changes of experimental plan. The details of test measurements are as follows; calibration of newly installed detectors, performance test of N_2 beam monitor, background measurement, performance test of a Gd_2O_3 radial collimator (RC), software development using TrigNET, and so on. In this report, we will focus on our activity for the development of Gd_2O_3-RC.

The needs for inelastic neutron scattering experiments under the special sample environment such as strong magnetic field and high temperature are recently increasing. However, the unwanted scatterings originating from these devices affect the detection of weak inelastic signals. In order to overcome this problem we have developed two types of RC specialized for the chopper spectrometers at MLF. One is made of Gd_2O_3 blades for low-energy neutrons, and the other is of Cd blades for relatively high-energy neutrons.

In case of magnetic scattering measurements, it should be important to detect the signal at around small scattering angle region. Thus, our radial collimators had several blades along the direct beam path. However, there was worry that the Gd_2O_3 blades whose substrate is made of polymer film may produce the backgrounds by the irradiation of direct incident beam. In order to evaluate these effects, we carried out the test measurements of Gd_2O_3-RC using 4SEASONS. The detector coverage of 4SEASONS is more appropriate for this evaluation. The elastic spectra of vitreous silica rod (dia.=8.5mm) measured at room temperature with a Gd_2O_3-RC (blue) and without a Gd_2O_3-RC (green) is given in Fig.1. The sample was set into the 4K cryostat conventionally used at 4SEASONS. From Fig.1(a) and (b), it is obvious that Gd_2O_3-RC can effectively shield the unwanted scattering from the cryostat window and provide us the high quality data. Fig.1(c) shows the experimental result by the incident energy of 300meV where the shielding ability of Gd_2O_3 is getting worse. It is clear that Gd_2O_3 blades along the direct beam path should cause the sufficient backgrounds for high-energy neutrons.

1．研究成果概要（つづき） Outline of experimental results (continued).

Following these evaluation tests, we decided to remove the Gd_2O_3 blades along the direct beam path. The Gd_2O_3 –RC has been in use with the user program.

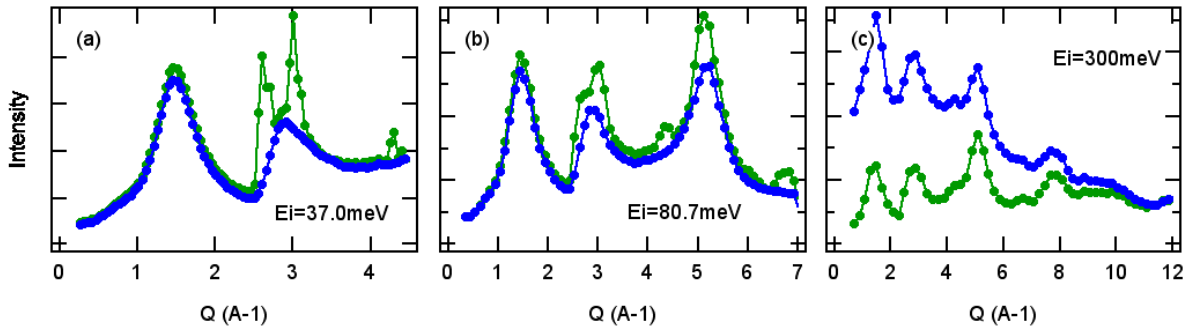

Fig.1: Q-dependences of the elastic structure factor for vitreous silica rod (d=8.5mm) with a Gd_2O_3-RC (blue) and without a Gd_2O_3-RC (green). The sample is set into the cryostat and the measurements are performed at room temperature. Incident neutron energy is (a) 37.0meV, (b) 80.7meV, and (c) 300meV.

(b) User support works

Instrument group staffs of 4SEASONS (R. Kajimoto (JAEA), M. Nakamura (JAEA), K. Ikeuchi (CROSS), K. Iida (CROSS), K. Kamazawa (CROSS)) performed user support works in pairs. One technical staff from CROSS (M. Ishikado) provided technical support to the instrument group staff of 4SEASONS. In addition, many staffs significantly contributed to the user support based on their specialty, such as software (Y. Inamura (JAEA)), sample environment (Y. Yamauchi (JAEA)), electric work (H. Tanaka (JAEA)), and machine design (W. Kambara (JAEA), K. Aoyama (JAEA)).

(c) Statistical Summary of user experiments

Twelve proposals were accepted as a “general proposal” of BL01 in JFY2013. Unfortunately, many proposals were canceled due to the J-PARC shutdown caused by Hadron accident in May 2013.

+ General proposal of 2013A: 9 → 3 Finished, 6 Canceled
+ General proposal of 2013B: 3 → 3 Finished

In addition, some special proposals such as “Urgent proposal”, “Trial use proposal”, “Elements Strategy Initiative proposal” were also performed in JFY2013.

+ Urgent proposal (2013A0002(U)) → Partially performed (due to the Hadron accident)
+ Trial use proposal (2013B0093) → Finished
+ Elements Strategy Initiative proposal (2013S0003) → Finished