Development and Experimental Performance Evaluation of N_2-gas Neutron Beam Monitor

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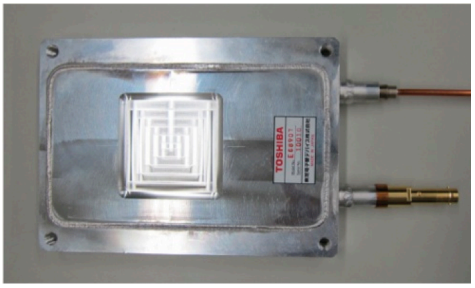

Fig. 1. A photograph of the N_2-gas neutron beam monitor.

A neutron beam monitor is a very important detector to measure a flux and its wavelength dependence of an incident neutron beam, which are indispensable for the correction of neutron scattering data. So far, various kinds of beam monitors such as a ^{3}He-gas neutron beam monitor have been developed and used, but demands for beam monitors with detection efficiency lower than 10^{-5} has increased as a beam flux has become intense at the neutron facilities such as the ILL and the Materials and Life Science Experimental Facility (MLF) of J-PARC. At the ILL a neutron beam monitor with N_2 gas instead of ^{3}He gas as detection gas was developed using the property of nitrogen nucleus, which has thermal neutron absorption cross section with about 1/2800th of that of ^{3}He nucleus [1]. We have developed a N_2-gas neutron beam monitor with original specification for neutron instruments at the MLF in collaboration with Toshiba Electron Tubes & Devices Co., Ltd. since 2008, too. A photograph of one of developed beam monitors is shown in Fig. 1. This beam monitor has been already installed a neutron instrument and has used. In this paper, we present the performance of the beam monitor such as position and high-voltage dependence of detection efficiency evaluated with an intense pulsed neutron beam of the MLF.

References

[1] http://www.ill.eu/fileadmin/users_files/ILL_News/34/34_news7.htm