Contribution ID: **50** Type: **Poster Presentation**

Simulation program for multiwire-type two-dimensional neutron detector with individual readout

Wednesday 14 September 2011 09:00 (1 hour)

Two-dimensional gas-based neutron detectors having a fast response time and high spatial resolution are required for some neutron scattering experiments performed using a high-intensity spallation neutron source at the Materials and Life Science Experimental Facility at J-PARC. We are currently developing a multiwire-type two-dimensional neutron detector system for use in such scattering experiments. This system can attain high response time and high spatial resolution by using the individual line readout method. The performance parameters of a gas-based two-dimensional neutron detector, such as spatial resolution and detection efficiency, strongly depend on the mixture gas condition of the neutron converter, stopping gas, and quenching gas, and this condition must be determined before the system is installed in the actual irradiation facility. Therefore, we developed a simulation program for our multiwire-type two-dimensional neutron detector system to determine the gas condition. Further, a small test system was fabricated to evaluate the simulation program. The simulation program involves the following calculations in each gas condition: the reaction probability between neutron and He-3, ranges of secondary particles generated by the nuclear reaction, ejection angle of the particles, wall effect of the conversion gap, and pitch of the multiwire element. The simulation results showed that the spatial resolution was 1.79 and 1.19 mm full width at half maximum (FWHM), and the detection efficiency was 53% and 59% at a total pressure of 5 atm (including 30% of CF4) and 7 atm (including 40% of CF4), respectively. Experimental results obtained using the small test system agreed well with the simulation results, and the measured spatial resolution was 1.80 and 1.12 mm FWHM. Thus, it was confirmed that the simulation program can be effectively used to determine the gas condition when the required spatial resolution and detection efficiency are known.

Preferred medium (Oral/poster)

poster

Author: Dr YAMAGISHI, Hideshi (Japan Atomic Energy Agency)

Co-authors: Dr SAKASAI, Kaoru (Japan Atomic Energy Agency); Dr SOYAMA, Kazuhiko (Japan Atomic Energy Agency); Dr TOH, Kentaro (Japan Atomic Energy Agency); Dr NAKAMURA, Tatsuya (Japan Atomic Energy Agency)

Presenter: Dr YAMAGISHI, Hideshi (Japan Atomic Energy Agency)

Session Classification: Poster Session