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Activity on Nuclear Data Measurement in Korea

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The activity on the nuclear data measurement was supported by the Korea Atomic Energy Research Institute (KAERI) as one of the nation-wide nuclear R&D project since 1997. Since then, the collaboration group for the nuclear data measurement was organized from universities and research institutes in Korea and joined several experiments in the various facilities in abroad, for example, the Research Laboratory for Nuclear Reactors at the Tokyo Institute of Technology (Titech), the Research Reactor Institute at Kyoto University (KURRI), and IBR-30 at the Joint Institute of Nuclear Research (JINR) in Dubna. After construction of the Pohang Neutron Facility (PNF) on December 1999, we started to measure the total cross-sections of several natural samples by using the time-of-flight (TOF) method.

The PNF consists of an electron linac, a water-cooled Ta target, and a 12-m long TOF path. The maximum energy of the electron linac is 75 MeV, and the measured beam currents at the entrance of the first accelerating structure and at the end of linac are 100 mA and 40 mA, respectively. The length of electron beam pulse is 1.0-2.0 μs, and the pulse repetition rate is 10-12 Hz. The characteristics of the facility are described elsewhere [1]. Two different data acquisition systems are used for the experiment: one for a NIM-based system and the other for a CAMAC-based system. The main purpose of the NIM-based system is neutron-gamma separation and the parallel accumulation of the neutron TOF spectra. The CAMAC-based system consists of a data acquisition part and the control part of a sample changer. The automatic sample changer consists of a disc with four holes; each hole is 8 cm in diameter, which matches the hole of the collimator in the neutron beam line. From 2000, we measured neutron total cross-sections of natural samples (Sm, Ag, Dy, In, W, Cu, Ti, Hf, Ta, Mo) in the neutron energy from 0.1 eV to 100 eV [2].

The PNF was operated according to the beam schedule of the Pohang Accelerator Laboratory as seen in http://pal.postech.ac.kr/. Most of the beam time (for example, 190 days in

2005) of the PNF could be used for the measurement of nuclear data. However, there are not so many users in domestic. Therefore, the PNF could be used for users in both the domestic and the foreign countries. The collaboration experiments with foreign users from China, India, Vietnam, and Russia were done since 2001.

However, the PNF had limitations for the nuclear data production; the neutron energy region was limited due to the short TOF path length and we only can measure the total cross sections.

In order to measure the capture cross-sections and the total cross-sections for the higher energy region, we have to utilize the foreign facilities. We had collaborated with Titech, KURRI, and JINR [3].

In addition to the PNF, Korea Institutes of Geology, Mining and Materials (KIGAM) was completed the pulsed neutron facility based on the 1.7 MV Tandem accelerator [4]. This facility could be used for the neutron cross-sections for nuclear reactor material in the fast neutron energy region. They measured neutron capture cross-sections of ^{65}Cu and ^{186}W with continuous neutron beams from ^{3}T(p,n)^{3}He reaction.

There is an MC-50 Cyclotron at Korea Institute of Radiological & Medical Sciences (KIRAM) which was used for the radioisotope production. Recently, they opened for the general users for basic and applied science. One group performed to find reliable excitation functions for Mo+p reactions in the energy range 5 ~30 MeV using a 35 MeV proton beam.

There are two facilities to be constructed in the near future. One is the Proton Engineering Frontier Project of KAERI, which will be consist of the 100-MeV proton linac and several beam facilities in the beam line of 20 MeV and 100 MeV by 2010[5]. The other is the 230 MeV Cyclotron which will be mainly used for the proton therapy at National Cancer Center in Korea and is expected to be completed by the end of 2005 [6]. There will be one beam line for R&D purpose.

Meanwhile, we have organized the Workshop on Nuclear Data Production and Evaluation every year at Pohang since 1998. The 8th Workshop was held on Aug. 25-26, 2005 at Pohang. In this workshop, fourteen foreigners from six countries attended and total 15 papers were presented. During this workshop, we discussed the possibility to make a unified conference among Asian countries because we had the “Workshop on Nuclear Data Production and Evaluation” and JAERI had the “Symposium on Nuclear Data”.

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