Measurement of Double-differential Cross Section of fragments on C, Al, Cu, Ag Induced by 400 MeV Helium

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Fragment production data at intermediate energy are important for evaluations of radiation dose and induced radioactivity. For verification of these evaluations, systematic experimental data are indispensable. The data are also needed to confirm validity of reaction models which are implemented in the theoretical calculations used such evaluations. Our group has started cross section measurements at the energies which enables fragment production. There are two typical methods to measure the fragments, one is an activation method and the other is a direct measurement. An activation method can determine absolute value easier; however the method cannot measure products without activity. A direct measurement can obtain double differential cross section, however it takes long time. We adopt both methods to obtain fragment production data in wide incident energies and target nuclides. In this presentation, devices and results of direct measurement are described.

Experiments are carried out at HIMAC. Incident beam is 400 MeV helium. Samples are Al, Cu, Ag in 10 μm thickness (only C is 100μm thickness). These samples are set at the center of a vacuumed scattering chamber. The chamber also equipped sample holder for activation measurement in front of beam dump. Fragments are measured a detector telescope which consists of Si surface barrier detectors (SSDs). The thicknesses of SSDs are 6μm and 250μm as ΔE and E, respectively. The distance between these two detectors is about 500 mm. This setup allows mass and Z determination simultaneously. Short rise time preamplifiers and a digital storage oscilloscope were adopted to accumulate signals with high time resolution. By using the device, double differential cross sections of ^{6}Li, ^{7}Li, ^{8}Li, ^{7}Be, ^{9}Be, ^{10}Be, ^{9}B, ^{10}B, ^{11}B production are obtained at 30-deg emission angle.