Contribution ID: **47** Type: **not specified**

Cross-section measurements in the reactions of ^{136}Xe on proton, deuteron and carbon at 168 AMeV

Friday 15 June 2018 10:40 (20 minutes)

Spallation reaction plays an important role in both fundamental research field and application field. For the fundamental research, spallation reaction is used as one of the mechanisms to produce unstable nuclei [1]. In application field, it is applied as neutron source in the accelerator-driven system [2] or for the transmutation of long-lived fission products (LLFP) [3]. In particular, ^{136}Xe (N=80, Z=54) is a good candidate as a projectile to study both of the two fields. ^{136}Xe is used as a primary beam in worldwide for radioactive beam generation. For transmutation, ^{136}Xe is a stable isotope, neighboring with LLFP ^{137}Cs. The comparison between ^{136}Xe and ^{137}Cs is critical to clarify the reaction mechanism and check the validity of the theoretical calculation used for ^{137}Cs [3].

In the present work, the isotopic cross sections of ^{136}Xe on proton, deuteron and carbon at 168 AMeV were measured by using the inverse kinematics method. The experiment was performed at the RIKEN Radioactive Isotope Beam Factory. The secondary beams were produced by in-flight fission of ^{238}U beam at 345 AMeV incident on a ^{9}Be target. The particles in the secondary beams were identified event by event in the BigRIPS separator. CH_2, CD_2 and C targets were used to induce secondary reactions. The proton- and deuteron-induced cross sections were deduced from the CH_2 and CD_2 targets after subtracting contributions from carbon (using data from the C target run) and beam-line materials (using data from the empty- target run). The reaction products were analyzed by the ZeroDegree spectrometer.

The cross sections for the reactions of ^{136}Xe on proton, deuteron and carbon will be reported as well as the target dependence. The energy dependence could also be investigated by the comparison of these experimental results to previous studies for ^{136}Xe at higher energies [5,6]. In addition, the measured cross sections will be compared with ^{137}Cs, and with the theoretical model calculation for spallation reaction.

This work was supported by ImPACT Program of Council for Science, Technology and Innovation (Cabinet Office, Government of Japan).

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Session Classification: Deuteron induced reactions

Track Classification: Deuteron induced reactions