STUDYING NEUTRON ANGULAR DISTRIBUTION FROM 0.5 GEV TO 1.5 GEV PROTON INDUCED REACTION ON HEAVY TARGETS ^{238}U, ^{206}Pb, ^{197}Au, ^{186}W

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Abstract:

The angular distributions of neutron were calculated for a spallation reaction induced by protons energy from 0.5 GeV to 1.5 GeV on target nuclei ^{206}Pb,^{197}Au, ^{238}U, ^{186}W. In this report, we used nuclear data of JENDL-HE [1] with evaluated proton induced cross-sections up to 3 GeV. The obtained results have been discussed in details.

Studying neutron angular distribution from (p,n) reaction is very important, because there are two reasons:

From the obtained results, we will understand further into structure and characteristics of nucleus. Furthermore, (p,n) reactions have been proved [2] to be an excellent tool to study spin-isospin excitation modes of nuclei. Angular distributions of the differential cross-section leading to the define states are analyzed with distorted wave Born-approximation.

This is a problem that has meanings in developing nuclear industry and designing the Accelerator Driven System.

There many authors have studied neutron angular distribution as H.F. Arellano and W.G.Love have studied of (p,n) reactions in the intermediate energy range[3]. These reactions are of great value in understanding the isovector modes of excitations of the nucleus as well the nuclear structure. As the experimental study for ^{6}Li(p,n)^{6}Be reaction has carried out at E_p = 50 ~ 80 MeV region of Kumagai et al.[4] that leading to states in the residual nucleus were measured. Petrovich and collaborator have reported [5] consistent folding model descriptions of nucleon elastic, inelastic charge- exchance scattering from ^{6,7}Li at 25-50 MeV….

In this work, we used nuclear data from available high energy files [1] with a support of simulation program to calculate angular distributions of the emitted neutron between cosine 0^0 and cosine180^0 were obtained on targets of Pb, Au, W, U with bombarding energies from 0.5 GeV to 1.5 GeV to supply need for the conceptual design of different field of applications: ***that is technology of radioactive waste transmutation and power production in Accelerator Driven System.***

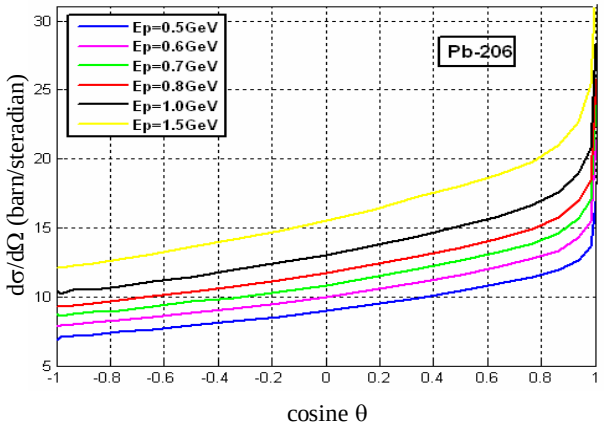

Fig.1: Different cross-sections for neutron on ^{206}Pb target

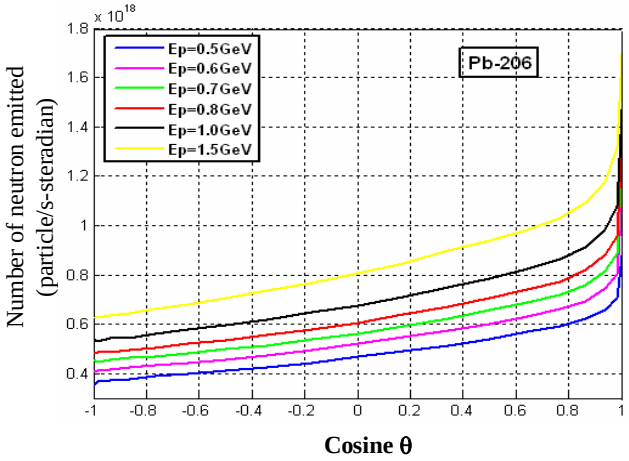

Fig. 2: Number of neutron emitted from (p,n) reaction on ^{206}Pb target

[1] JENDL-HE- 2007- Nuclear data Center, Japan Atomic Energy Agency http://www.ndc.jaea.go.jp/jendl/jendl.html

[2] Goodman C.D.et al., Phys, Rev.Lett.44(1980) 1755.

[3] H.F.Arellano and W.G.Love, "Nuclear halo structure from quasielastic charge-exchange reactions"

[4] Kumagai K., Orihara H., Kikuchi Y., Sugimoto N., Suzuki H. , "^{6}Li(p, n)^{6}Be reaction at E_p=70 MeV", CYRIC annual report 2001

[5] Petrovich F. et al., Nucl. Phys. A563 (1993) 387