DIFFERENTIAL CROSS SECTION MEASUREMENT OF ELASTIC SCATTERING $^{12}C(p,p)^{12}C$ IN THE ASTROPHYSICAL RANGE OF ENERGY

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The fulfillment of planned works on measurements of differential cross sections of elastic scattering of protons on nuclear ^{12}C at the energy region of 350 ÷ 1050 keV suggests the preparation of thin self – supporting carbon target. The self - supporting target is necessary in order to perform investigations in the total angular range. In the future last data will be used in order to determine optical potentials and scattering phases for this nuclear in the energy range of astrophysical interest.

There was prepared target layer of the ^{12}C with natural composition of carbon and of thickness of 17.4 μg/cm^2. The spraying was conducted in the vacuum evaporation installation (VUP - 4) by an electron bombardment method.

Carbon was sprayed on a glass plate with previously deposited of layer salt. After a heating during 12 hours at the temperature of 150 ^{0}C the film of carbon was floated from glass plate and self – supporting target has been picked up on the specially prepared target frame.

In order to determine thickness of target there was used the resonance chamber, installed in the protons channel of the accelerator RAC – 2 - 1 (INP NNC RK), with the help of which there was measured energy loss of the protons beam during the passage through target, disposed in the central chamber. For this purpose there was used the reaction $^{27}Al(p,\gamma)^{28}Si$ with narrow resonance with E_R = 992 keV and with detection of gamma-quanta with E_γ = 1779 keV. On shift of the resonance E_R=992 keV in the reaction $^{27}Al(p,\gamma)^{28}Si$, which takes place owing to protons energy loss in the thickness of carbon film, and using table values of brake quantities $S(E_p)$[MeV•cm^2/g] [1], there was determined thickness of this fine film. Such the method allows to determine thicknesses of films in the interval of (10 ÷ 100) mcg/cm^2 with the accuracy of not worse than 5%.

In the present work there were carried out measurements of angular distributions of cross sections of the elastic scattering $^{12}C(p,p)^{12}C$. The accelerated protons beam passed through the target, and the Faraday cup, disposed behind the target detected the beam current.

Measurements of spectra were carried out with the help of the detector of charged particles at energies of protons E_P = 350, 400, 450, 550, 750, 1050 keV. At the every energy there was measured the angular distribution in the range of from 30^0 to 170^0 with the step of 10^0.

During the measurements the carbon - target was placed at the angles of 45^0 or 135^0 to the incident protons beam depending on the angle of the detector location.

From the concurrent analysis experimental results and literary data, within the framework of optical model, the optimum parameters of potential of interaction of protons with a ^{12}C nucleus are obtained.

Reference:

1. O.F. Nemets, Yu.V. Goffman. "Reference book on nuclear physics". Kiev (1975).