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STUDY OF ELASTIC SCATTERING OF SULFUR IONS FROM ^{12}C, ^{16}O, ^{27}Al NUCLEI AT ENERGIES NEAR THE COULOMB BARRIER

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Study of interaction of sulfur ions with ^{12}C, ^{16}O, ^{27}Al nuclei at energies near the coulomb barrier is interesting from the point of view of determining reliable values of heavy ions internuclear interaction potentials which are necessary for understanding burning processes of these elements in stars.

Similar processes have been studied in [1] and [2]. Cross sections in these papers have been measured at backscattering angles range and significant difference between these cross sections and Rutherford scattering cross sections has been shown.

The aim of this study is to obtain experimental data in full angular range as well as analysis of obtained cross sections in framework of reliable, tested nuclear models.

Experiments were performed at DC-60 INP cyclotron (Astana). Energy of accelerated beam was 1.75 MeV/nucleon. Scattering cross sections measurements were made in 10°-75° angular range in laboratory system. Particles were registered by silicon detectors with sensitive layer of 100 μm. Thin film targets made of ^{12}C and Al_2O_3 with thickness of 20-40 μg/cm^2 were used. Targets thicknesses were determined with uncertainty no more than 5%. Energy resolution of registration system was 250-300 keV, which mainly was due to primary beam energy spread. Overall absolute uncertainty of obtained data did not exceed 10%.

We did not observe any significant oscillations and enhancements in obtained experimental cross sections. It is probably due to the fact that cross section is formed by pure potential scattering and there is no contribution of any transfer processes in systems under study.

Analysis of sulfur ions scattering from aluminium cross sections showed that they do not differ from Rutherford scattering cross sections at given energy. $^{32}S+^{16}O$ and $^{32}S+^{12}C$ processes were analyzed within the framework of standard optical model and double folding model using FRESCO computer code. Optimal parameters of interaction potentials for given systems were determined.

References

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