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Peculiarities of interaction of weakly bound lithium nuclei at low energies

The review presents the latest experimental data on the total reaction cross sections (σR) and elastic scattering angular distributions of light weakly bound nuclei 6–9,11Li [1].
A review of papers on the interaction of weakly bound 6-9Li and 11Li nuclei published so far and their analysis shows that there are no experimental data on σR and it is necessary to measure it for Li-isotopes at energies from the Coulomb barrier Bc=3–4 MeV up to 10-40 MeV/A on 28Si, 27Al, 9Be, and 12C nuclei.
The new data on σR for reactions 8,9Li+28Si in the energy range 5–30 MeV/A with their analysis are presented in [2]. In the σR energy dependence of 9Li+28Si reaction, a "bump", i.e., a local increase in the cross section in the energy interval 10-30 MeV/A, was first observed. Therefore, this dependence requires further theoretical analysis and experimental study.
Large σR values detected in the σR(E) dependence, as well as their rapid increase in a short energy interval in the low-energy region, can lead to a release of a large amount of energy, which is interesting in terms of search for new energy sources of the future.
The obtained new data (the existence of an anomalous increase in the σR) in a narrow energy range 10-30 MeV/A in the (6He, 9Li)+28Si reactions at Bc energies will enable scientists to explain important questions of nucleosynthesis (nuclear astrophysics).
One of the most important features explaining why light elements are abundant in the universe is the increase in the interaction cross sections in the sub-barrier energy region in nuclear reactions with weakly bound nuclei. This effect is especially strongly manifested for light cluster nuclei 6,9,11Li and nuclei with a neutron halo 6,8He and 11Li. The main channels of interaction of such nuclei are transfer, breakup and complete-fusion reactions.

1 Kuterbekov K.A. et.al. Chinese Journal of Physics (2017) 55 2523.
2 Kabyshev A.M. et al. J.Phys.G (2018) 45 025103.

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