

Studies of the reactions ${}^9\text{Be}(,d)$ and ${}^9\text{Be}(,)$ in the energy range of 300-1400 keV

Monday, 20 September 2021 16:00 (25 minutes)

At present, at low astrophysical energies there is experimental information on the cross sections of the reactions ${}^9\text{Be}(,d_0)$ and ${}^9\text{Be}(,{}_0)$ obtained by different authors [1-14]. Nevertheless, as shown in the review [15], the extrapolation of the S-factors of these reactions to zero energy has a large uncertainty (the difference is up to 10 times). This is partly due to the many resonances present at low energies. For reliable extrapolation of experimental data, for example, by the R-matrix method, it is very important to have accurate experimental data in the regions of the maxima and minima of the available resonances. Obtaining these data for the region $E_{p,lab} = 300 - 1400$ keV the present work that has been carried out at the electrostatic tandem accelerator UKP-2-1 of the Institute of Nuclear Physics (Almaty) is devoted. The Be film of natural isotopic composition (${}^9\text{Be} \sim 100\%$) was used as a target. Detailed description of the accelerator and experimental methods can be found in [16, 17] and in their references.

The measurement of the differential cross sections of the reactions ${}^9\text{Be}(p,d_0)$ and ${}^9\text{Be}(,{}_0)$ at the range of angles $\theta_{lab} = 200 - 1650$ with a step of 100 at $E_{p,lab} = 400, 600, 940, 1050, 1200, 1300$ and 1400 keV have been carried out with an error of about 15%. We also measured the excitation functions of these processes for the angles $\theta_{lab} = 700$ and 1600 in the energy range $E_{p,lab} = 300 - 1400$ keV with a step of 10 - 20 keV. Within the limits of error, the results of the present experiment coincided with the literature data in the overlapping areas.

References:

1. J.A. Neuendorffer, D.R. Inglis, S.S. Hanna, Phys. Rev. **82**, 75 (1951).
2. G. Weber, L.W. Davis, J.B. Marion, Phys. Rev. **104**, 1307 (1956).
3. G.M. Hudson et al., Nucl. Phys. A **184**, 175 (1972).
4. A.J. Sierk, T.A. Tombrello, Nucl. Phys. A **210**, 341 (1973).
5. D. Zahnow, C. Rolfs, S. Schmidt, H.P. Trautvetter, Z. Phys. A **359**, 211 (1997).
6. C.R. Bruneet al., Phys. Rev. C **57**, 3437 (1998).
7. R.B. Day, R.L. Walker, Phys. Rev. **85**, 582 (1952).
8. J.B. Marion, J. S. Levin, Phys. Rev. **115**, 144 (1959).
9. H.R. Blieden, G.M. Temmer, K.L. Warsh, Nucl. Phys. **49**, 209 (1963).
10. T. Yanabuet al., J. Phys.Soc. Japan **19**, 1818 (1964).
11. S. Moritaet al., Nucl. Phys. **66**, 17 (1965).
12. Q.-G. Wen et al., Phys. Rev. C **78**, 035805 (2008).
13. N. Catarino et al., Nucl. Instr. and Meth. B **371**, 50 (2016).
14. S. Krat et al., Nucl. Instr. and Meth. B **358**, 72 (2015).
15. Yi Xu et al., Nucl. Phys. A **918**, 61-169 (2013); <http://arxiv.org/abs/1310.7099v1>.
16. N. Burtebayev et al., Phys. Rev. C **78**, 035802 (2008).
17. S. Dubovichenko et al., Chinese Physics C **41**, 014001-1 (2017).

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Session Classification: Section 2. Experimental and theoretical studies of nuclear reactions

Track Classification: Section 2. Experimental and theoretical studies of nuclear reactions.