

The Study of Multi-Nucleon Transfer Reactions for Synthesis of New Heavy and Superheavy Nuclei

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Exotic nuclei are usually produced by projectile fragmentation or projectile fission at relativistic energies, or in complete fusion reactions at Coulomb barrier energies. These production methods and the available beam intensities determine the present boundaries of the chart of nuclides. However, it is estimated that several thousand further isotopes are expected to exist on the neutron-rich side, including most of the nuclei along the astrophysical r-process path. Multi-nucleon transfer (MNT) reactions could be a possible way to expand into this unknown territory. The results achieved so far provide an idea of the potential of MNT reactions for nucleosynthesis.

The development of techniques to separate and detect heavy transfer products is ongoing. Our results will be discussed together with previous measurements, and perspectives will be given for the application of MNT reactions to produce new heavy and superheavy isotopes [1-5]. The project of a new kinematic separator, the "Separator for Transactinide Research" (STAR), which will be designed to study MNT reactions at the Flerov Laboratory of Nuclear Reactions of the JINR, Dubna, will be discussed [5-6]. The project will be implemented together with the modernization of the U400 cyclotron (U400R).

References:

1. H.M. Devaraja, S. Heinz, O. Beliuskina, V. Comas, S. Hofmann, et al., Phys. Lett. B 748, (2015) 199–203.
2. H.M. Devaraja, S. Heinz, O. Beliuskina, S. Hofmann, C. Hornung, et al., Eur. Phys. J. A 55, (2019) 25.
3. H.M. Devaraja, S. Heinz, D. Ackermann, T. Göbel, F.P. Heßberger, et al., Eur. Phys. J. A 56, (2020) 224.
4. S. Heinz, H.M. Devaraja, Eur. Phys. J. A 58, (2022) 114.
5. H.M. Devaraja, A.V. Yeremin, S. Heinz and A.G. Popeko, Phys. Part. Nucl. Lett. 19, (2022) 693-716 (2022)
6. A. Yeremin, "Prospects of investigation of multinucleon transfer reactions," in Proceedings of the Programme Advisory Committee for Nuclear Physics 51st Meeting, January 30–31, 2020, Dubna, Russia.

Primary author: DEVARAJA, H. M. (JINR)

Presenter: DEVARAJA, H. M. (JINR)

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