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Nucleosynthesis in Multinucleon Transfer Reactions

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For decades, fragmentation, fission and fusion reactions are versatile tools to produce exotic nuclei in the lab. However, these standard nucleosynthesis reactions are reaching their limits. To enter new territory on the chart of nuclides, new pathways to exotic nuclei are needed. Mainly on the neutron-rich side, several thousand further isotopes are expected to exist, including most of the nuclei along the astrophysical r-process path.

Years ago, the idea arose to “revive” multi-nucleon transfer reactions to progress toward the neutron rich side of heavy and superheavy nuclei. Meanwhile, this option is investigated in nuclear physics labs worldwide. Beside new studies of transfer product kinematics and cross-sections, the development of suitable separation and detection techniques for heavy transfer products is ongoing. How promising are these new advances? So far achieved results allow us to get an impression on the potential which multi-nucleon transfer reactions provide for nucleosynthesis.

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