New neutron-rich isotope production in ^{154}Sm+^{160}Gd

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Deep inelastic scattering in ^{154}Sm+^{160}Gd at energies above the Bass barrier is for the first time investigated with two different microscopic dynamics approaches: improved quantum molecular dynamics (ImQMD) model and time dependent Hartree-Fock (TDHF) theory. No fusion is observed from both models. The capture pocket disappears for this reaction due to strong Coulomb repulsion and the contact time of the di-nuclear system formed in head-on collisions is about 700 fm/c at an incident energy of 440 MeV. The isotope distribution of fragments in the deep inelastic scattering process is predicted with the simulations of the latest ImQMD-v2.2 model together with a statistical code (GEMINI) for describing the secondary decay of fragments. More than 40 extremely neutron-rich unmeasured nuclei with $58 \leq Z \leq 76$ are observed and the production cross sections are at the order of μb to mb. The multi-nucleon transfer reaction of Sm+Gd could be an alternative way to synthesize new neutron-rich lanthanides which are difficult to be produced with traditional fusion reactions or fission of actinides.

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[1] Ning Wang and Lu Guo, Phys. Lett. B **760** (2016) 236.