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Production of Au isotopes through neutron transfer reactions in the ^{48}Ca + ^{197}Au collision

The study of nucleon transfer reactions is an important area of heavy ion physics because these reactions provide the possibilities for the synthesis of new nuclei [1, 2]. Multi-neutron transfer reactions are one of the tools to access neutron-rich isotopes. Nuclei along N = 126 are of main interest because of the expected existence of the r-process third waiting point within this region.

We investigated the production of Au isotopes through neutron transfer reactions in the Ca + Au collision at a beam energy of 300 MeV [3]. The target-like products were captured and stopped within an assembly of Au targets after being irradiated with a Ca beam. The populated isotopes were identified through gamma decay spectroscopy and production cross-sections were determined. Furthermore, we performed model calculations based on the solution of the time-dependent Schrödinger equation for neutrons [4, 5]. The process of neutron transfer occurs through the formation of a two-center bound state at the moment of maximum approach of the nuclei. To describe the cross sections and compare with the results of calculations within the framework of the model based on the time-dependent Schrödinger equation, calculations using the Grazing code were performed. The calculations are in agreement with experimental data.

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Section

Nuclear physics (Section 1)

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