MICROSCOPIC APPROACH TO ALPHA-NUCLEUS OPTICAL POTENTIALS FOR NUCLEOSYNTHESIS

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The evaluation of nuclear reaction cross sections for nucleosynthesis relies strongly on the optical potentials of the involved collision systems. In these calculations α-optical potentials for medium to heavy nuclei are a significant source of uncertainty because elastic scattering at low energies is experimentally not well accessible due to strong Coulomb suppression. Thus phenomenological optical potentials require extrapolation to low energies and are subject to uncontrollable errors. The situation is even more intriguing because nucleosynthesis reaction networks involve isotopes off the stability line. In this contribution we present a microscopically based approach of the α-nucleus optical potential. Based on the g-matrix of [1] a nuclear matter α-optical potential is generated and combined with an adapted nuclear structure component [2] which accounts for collective states. Apart from the Skyrme-based RPA calculations [3] of the collective states the approach makes consistent use of the g-matrix as an effective interaction. Comparing with experimental data the applicability of the approach to elastic scattering and reactions relevant in nucleosynthesis is shown for several medium-heavy and heavy nuclei. Work part of the EUROCORES project EuroGenesis supported by Fonds zur Förderung der Wissenschaftlichen Forschung (FWF) Österreich under project number I 426-N16.

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