

Alpha-capture reactions relevant to the p -process nucleosynthesis

A. Spyrou, A. Lagoyannis, Ch. Zarkadas, S. Harissopoulos

*Institute of Nuclear Physics, National Centre for Scientific Research “Demokritos”,
153.10 Aghia Paraskevi, Athens, Greece*

H.-W. Becker, F. Strieder, C. Rolfs

*Institut für Physik mit Ionenstrahlen, Ruhr-Universität Bochum,
Universitätsstr. 150, 40781 Bochum, Germany*

A. Dewald, K.-O. Zell, P. von Brentano

Institut für Kernphysik, Universität zu Köln, Zulpicherstr. 77, 50937 Köln, Germany

R. Julin

Department of Physics, University of Jyväskylä, P.O.Box 35, 40014 Jyväskylä, Finland

Abstract

The Hauser-Feshbach (HF) theory is extensively used in the calculation of reaction cross sections relevant to the p -process nucleosynthesis, since the vast majority of the over 20000 cross sections involved cannot be determined experimentally. To date, all the models of the p -process nucleosynthesis are able to reproduce most of the p -nuclei abundances within a factor of 3, but they fail in the case of the light p nuclei. It is therefore of key importance, on top of any astrophysical model improvements, to investigate the uncertainties in the nuclear data, and in particular, in the nuclear level densities (NLD) and optical model potentials (OMP) entering the HF calculations. In order to contribute to a database of cross sections relevant to the modelling of the p process and to better constrain α -particle-nucleus potentials, we have performed several cross section measurements of α -capture reactions in the Ge-Sn region at energies well below the Coulomb barrier. This contribution reports on this systematic work consisting of 7 (α, γ) reactions. Our results as well as all other existing data are compared with HF calculations using various microscopic and phenomenological models of the nuclear input (NLD, OMP).