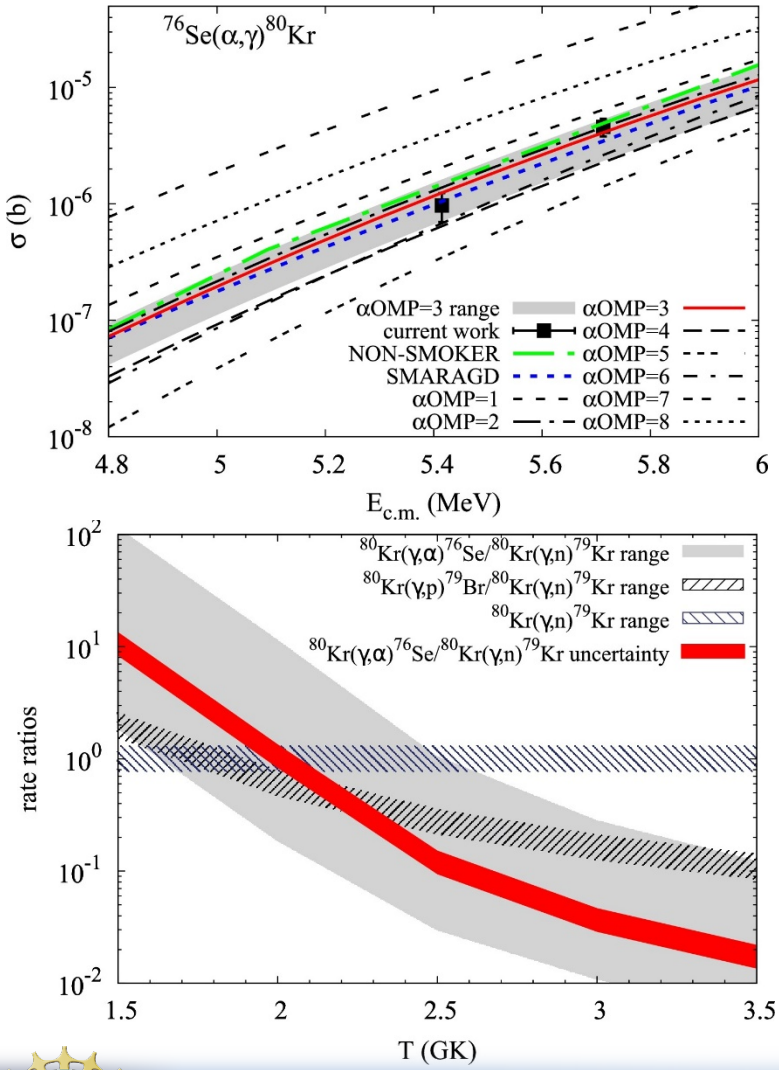
First measurement in the Gamow window of a reaction for the γ-process in inverse kinematics: $^{76}Se(\alpha,\gamma)^{80}Kr$



The *p*-nuclei are the few stable nuclei heavier than iron on the neutron-deficient side of the valley of stability that cannot be produced through astrophysical neutron-capture reactions. The limited experimental data on reactions through which the *p*-nuclei might be produced leaves the origin of their production largely unknown. This work presents the first cross section measurements of the $^{76}Se(\alpha,\gamma)^{80}Kr$ reaction. The rate of the time reversed reaction, $^{80}Kr(\gamma,\alpha)^{76}Se$, is one of the most uncertain of possible reactions which can occur at the ^{80}Kr branching point on the *γ*-process photo-disintegration pathway. The reaction flow through ^{80}Kr will directly affect the final abundance of the *p*-nuclide ^{78}Kr. Experimental cross sections at two astrophysically relevant energies are reported and compared to cross sections calculated using Hauser-Feshbach codes TALYS, NON-SMOKER, and SMARAGD. The success of these first (α,γ) cross section measurements performed in inverse kinematics in the energy region of the *γ*-process opens the door for future studies of reactions on radioactive *γ*-process nuclides.

J.Fallis, C.Akers, A.M.Laird, A.Simon, et al.,
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