Contribution ID: **7** Type: **not specified**

Collective effects and resonances in (n,□) reactions on neutron-rich nuclei: a continuum RPA approach

Wednesday, 8 March 2023 15:10 (5 minutes)

The radiative neutron capture is one of the elementary processes which play key roles in the r-process nucleosynthesis. The nuclei on the r-process path have a small neutron separation energy of typically ~2 MeV, and hence the statistical neutron-capture model often adopted to describe the s-process may not be appropriate. In the present work, we formulate a novel theory [1,2] which describes the (n,□) reaction in a single microscopic many-body framework with no statistical assumptions using the continuum random-phase approximation (cRPA) based on the nuclear density functional theory.

With the cRPA approach, it is possible to describe various excitation modes present in the (n,□) reaction, including soft dipole excitation, the giant resonances as well as non-collective excitations and the single-particle resonances. Furthermore, it enables us to describe the (n,□) reaction where the final states of the gamma transition are low-lying surface vibrational states. We demonstrate the theory by performing numerical calculation for the reaction 139Sn (n,□) 140Sn. We discuss various new features which are beyond the exiting models; presence of narrow and wide resonances originating from non-collective and collective excitations and roles of low-lying quadrupole and octupole vibrational states.

[1] T. Saito and M. Matsuo, Phys. Rev. C 104, 034305 (2021).
[2] T. Saito and M. Matsuo, arXiv.2208.09455

Experimental study on nuclear physics

Primary authors: SAITO, Teruyuki (Graduate School of Science and Technology, Niigata University); MATSUO, Masayuki (Faculty of Science, Niigata University)

Presenters: SAITO, Teruyuki (Graduate School of Science and Technology, Niigata University); MATSUO, Masayuki (Faculty of Science, Niigata University)

Session Classification: Poster Session