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Density functional theory of direct neutron capture cross section for the r-process nucleosynthesis[1] MASAYUKI MATSUO, Niigata University — The neutron capture is one of the fundamental nuclear processes relevant to the r-process nucleosynthesis. The direct (radiative) neutron-capture process is expected to dominate over another process via the compound states as the neutron separation energy in many of the r-process nuclei are very low ($S_n \leq 2$ MeV). Previous theories often employ single-particle models, but such models hardly describe the correlation, e.g. the pygmy dipole mode. We propose a new microscopic theory of the direct neutron capture, which is based on a re-formulation of the continuum quasiparticle random phase approximation (the linear response theory) for the Skyrme-Bogoliubov energy density functional model. This theory allows us to take into account collective correlations in the capture of low-energy neutron (from 10 keV to 1 MeV) and associated photo-emission. In this presentation, I shall discuss essential ingredients and new facets of this capture theory, and illustrate them by numerical examples. The examples are shown for neutron-rich Sn isotopes with A=134-150, which are expected to line along the r-process path. We shall discuss roles of the neutron pair correlation which becomes important as the neutron separation energy becomes lower.

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