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Nuclear structure for SNe r- and neutrino processes

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SNe r- and neutrino-processes are investigated based on recent advances in the studies of spin responses in nuclei. New shell-model Hamiltonians, which can well describe spin responses in nuclei with proper tensor components, are used to make accurate evaluations of reaction cross sections and rates in astrophysical processes. Nucleosyntheses in SNe r- and ν-processes as well as rp-processes are discussed with these new reaction rates with improved accuracies.

1. Beta-decay rates for N=126 isotones are evaluated by shell-model calculations, and new rates are applied to study r-process nucleosynthesis in SNe's around its third peak as well as beyond the peak region up to uranium.

2. ν-processes for light-element synthesis in core-collapse SNe are studied with a new shell-model Hamiltonian in p-shell, SFO. Effects of MSW ν-oscillations on the production yields of ^{7}Li and ^{11}B and sensitivity of the yield ratio on ν-oscillation parameters are discussed. ν-induced reactions on ^{16}O are also studied.

3. A new shell-model Hamiltonian in pf-shell, GXPF1J, is used to evaluate e-capture rates in pf-shell nuclei at stellar environments. New e-capture rates are applied to study nucleosynthesis in type-Ia supernova explosions, rp-process and X-ray bursts.