Neutrino-Nucleus Reactions and Nucleosynthesis

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Neutrino-induced reactions on $^{12}$C, $^4$He as well as Fe and Ni isotopes are studied based on recent advances in shell model calculations in $p$-shell and $fp$-shell. Gamow-Teller and spin-dipole transitions are investigated with the use of the new shell model Hamiltonians [1,2], and applied to neutrino-nucleus reactions induced by both DAR and supernova neutrinos [3]. The reaction cross sections are found to be enhanced compared with those by conventional Hamiltonians as well as previous calculations [4]. The production yields of $^7$Li and $^{11}$B during supernova explosions are found to be enhanced [3], and the effects of neutrino oscillations are discussed [5]. Neutral current reactions on Ni isotopes induced by supernova neutrinos are investigated. A possible implication of neutrino-induced reactions on the production yields of heavy elements such as Mn and Co in population III stars is also discussed [6].

References