Abstract Submitted
for the HAW14 Meeting of
The American Physical Society

Roles of light nuclei in dense matter for supernova explosions
KOSUKE SUMIYOSHI, Numazu College of Technology, SHUN FURUSAWA, Center for Computational Astrophysics, National Astronomical Observatory of Japan, HIROKI NAGAKURA, Yukawa Institute for Theoretical Physics, Kyoto University, HIDEYUKI SUZUKI, Faculty of Science and Technology, Tokyo University of Science, SHOICHI YAMADA, Department of Science and Engineering, Waseda University — We report on appearance of light nuclei in supernova cores and its possible roles for the explosion dynamics of core-collapse supernovae. We show that the light nuclei (deuterons, tritons and helium isotopes) are abundant in hot and dense matter for a certain layer of the supernova cores. The extended framework of the relativistic mean field theory with mixture of nuclei has been applied to construct the data of equation of state for supernova simulations. Medium and temperature effects are taken into account for bulk and shell energies of nuclei. Such abundant light-nuclei may act as additional agents of neutrino cooling and heating in the supernova core. Additional neutrino reactions with light nuclei may assist or harm shock propagation for the successful explosions. We demonstrate that neutrino absorptions may have impact on revival of the shock wave by numerical simulations. The time evolutions of shockwave, which is initially stalled, in 2D supernova cores have been studied by following hydrodynamics with the neutrino heating processes. We found that neutrino heating via light nuclei can be influential for the critical situation for the revival of shock wave. We discuss also novel roles of neutrino reactions with light nuclei in neutrino emitting regions.

Kosuke Sumiyoshi
Numazu College of Technology

Date submitted: 27 Jun 2014 Electronic form version 1.4