Abstract Submitted
for the APR18 Meeting of
The American Physical Society

Equation of state of low-density supernova matter with multiple nuclei in the mean field approximation[1] SUDHANVA LALIT, CONSTANTINOS CONSTANTINOU, MD. ABDULLAH AL MAMUN, MADAPPA PRAKASH, Ohio University — The Lattimer-Swesty (LS) approach[1], often used in the construction of equations of state (EOS) for astrophysical applications, considers only a mixture of nucleons, alpha particles and electrons in the dissociated region (where conditions are such that heavy nuclei cannot persist). Here, we develop a framework which supplements the excluded-volume technique of LS with a mean-field treatment of attractive interactions and, furthermore, incorporates other light nuclei such as deuterons, tritons, and Helium-3 which are present and affect the thermal characteristics of the EOS as was demonstrated in the virial approach adopted by Horowitz and Schwenk[2] and Arcones et al.[3]. The nuclear statistical equilibrium method, commonly used to account for these nuclei, is applicable in the case when interactions between the various constituents can be ignored and hence it is not valid at the densities of relevance to this region. We show numerical results to demonstrate the extent to which abundances of the various nuclei and the EOS are affected and, where possible, comparisons with the virial approach are made. [1] J. M. Lattimer and D. Swesty, Nucl. Phys. A535 (1991) 331. [2] C. J. Horowitz and A. Schwenk, Nucl. Phys. A776 (2006) 55. [3] A. Arcones, et al., Phys.Rev.C 78 (2010) 015806.

[1]U. S. Department of Energy

Sudhanva Lalit
Ohio University

Date submitted: 11 Jan 2018 Electronic form version 1.4