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Equation of State for Asymmetric Nuclear Matter at Finite Temperatures with the Variational Method HAJIME TOGASHI, HIROAKI KANZAWA, MASATOSHI TAKANO, Waseda University, KAZUHIRO OYAMATSU, Aichi Shukutoku University, KOHSUKE SUMIYOSHI, Numazu College of Technology — The free energies of uniform nuclear matter at various densities, temperatures and proton fractions are calculated with the variational method, toward a new nuclear equation of state (EOS) for supernova simulations. Following the method by Schmidt and Pandharipande, the expectation value of the two-body Hamiltonian with the AV18 potential is calculated in the two-body cluster approximation. The averaged occupation probabilities of the single particle states in the Jastrow trial wave function at finite temperature are parameterized by the proton and neutron effective masses. The energy caused by the UIX three-body potential is treated somewhat phenomenologically so as to obtain the realistic nuclear EOS at zero temperature. The entropy is also expressed with the averaged occupation probabilities, and then the free energy is minimized with respect to the effective masses. The proton fraction dependence of the obtained thermodynamic quantities is discussed.

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