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Three-Body Force Effects on EOS of Asymmetric Nuclear Matter and Proton Fraction in Neutron Star Matter

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Abstract: The three-body force effects on the equation of state and its iso-spin dependence of asymmetric nuclear matter and on the proton fraction in neutron star matter have been investigated within Brueckner-Hartree-Fock approach by using a microscopic three-body force. It is shown that, even in the presence of the three-body force, the empirical parabolic law of the energy per nucleon vs. isospin asymmetry $\beta=(N-Z)/A$ is fulfilled in the whole asymmetry range $0 \leqslant \beta \leqslant 1$ and also up to high density. The three-body force provides a strong enhancement of symmetry energy at high density in agreement with relativistic approaches. It also shows that the three-body force leads to a much more rapid increasing of symmetry energy with density in relatively high density region and to a much lower threshold density for the direct URCA process to occur in a neutron star as compared to the predictions adopting only pure two-body force.

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