MAGNETIZATION OF DENSE NEUTRON MATTER IN A STRONG MAGNETIC FIELD

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S u m m a r y

Spin polarized states in neutron matter at a strong magnetic field up to 10^{18} G are considered in the model with the Skyrme effective interaction. Analyzing the self-consistent equations at zero temperature, it is shown that a thermodynamically stable branch of solutions for the spin polarization parameter as a function of the density corresponds to the negative spin polarization when the majority of neutron spins are oriented oppositely to the direction of the magnetic field. In addition, beginning from some threshold density dependent on the magnetic field strength, the self-consistent equations have also two other branches of solutions for the spin polarization parameter with the positive spin polarization. The free energy corresponding to one of these branches turns out to be very close to the free energy corresponding to the thermodynamically preferable branch with the negative spin polarization. As a consequence, at a strong magnetic field, the state with the positive spin polarization can be realized as a metastable state at the high density region in neutron matter which changes into a thermodynamically stable state with the negative spin polarization with decrease in the density at some threshold value. The calculations of the neutron spin polarization parameter, energy per neutron, and chemical potentials of spin-up and spin-down neutrons as functions of the magnetic field strength show that the influence of the magnetic field remains small at the field strengths up to 10^{17} G.