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Influence of strong magnetic field on the equation of state and the structure properties of strange quark stars

We investigate the thermodynamic properties of strange quark matter under the strong magnetic field in the framework of the MIT bag model with the density-dependent bag constant. We consider two cases of the magnetic field, the uniform magnetic fields, and the density-dependent magnetic field to calculate the equation of state of strange quark matter. For the density-dependent magnetic field case, we use a Gaussian equation with two free parameters β and θ and use two different sets of the parameters for the magnetic field changes (a slow and a fast drop of the magnetic field from the center to the surface). Our results show that the energy conditions based on the limitation of the energy-momentum tensor are satisfied in the considered conditions. We also show that the equation of state of strange quark matter becomes stiffer by increasing the magnetic field. In the current paper, we also calculate the structure parameters of a pure strange quark star using the equation of state. We investigate the compactness of strange quark star by the compactification factor and the surface redshift. The results show that the strange quark star is denser than the neutron star. In addition, it is more compact in the presence of the stronger magnetic field. As another result, the compactness increases when we use a slow increase of the magnetic field from the surface to the center. Eventually, we compare our results with the observational results for some strange star candidates, and we find that the structure of the strange star candidates is comparable with that of the star in our model.

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