

Influence of Model Parameters on Hadron-Quark Phase Transition in Neutron Star Matter

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Abstract: We study the influence of the model parameters on the phase transitions, the equation of state (EOS), and the corresponding mass-radius relations in the interior of neutron stars. The numerical analysis shows that the coupling constants of hyperons have a slight influence on the phase transitions and EOS, but an obvious influence on the particle fractions, while the bag constant B and coupling constant g have an important influence on the phase transitions, the EOS, and the mass-radius relations. We find that both the bag constant B and coupling constant g play the same role in the description of the interactions between quarks of hybrid stars. The maximum mass calculated by using the bag constant determined with experimental data (ranging from 175 to 200 MeV) falls in the interval of 1.4~1.7 solar mass. The corresponding radius is between 9.3 and 12 km. These results are in agreement with observed values of neutron stars. The possibility of the existence of a third family is discussed. The detection of a third family may provide a signature for a phase transition inside neutron stars.

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Key words: phase transition, equation of state, mass-radius relation, third family

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