Phase transitions and core-collapse in the neutron stars

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Some models of dense matter predict the possibility of phase transition at very high densities which can be reached in the center of neutron stars. Evolutionary processes as an accretion of the matter onto a neutron star or slowing down of an isolated pulsar can lead to the increase of the central density. A first-order phase transition allows for a metastability of the pure "normal" (lower density) phase at densities larger than the density corresponding to the equilibrium between the two phases. Consequently, a metastable core could form during the neutron-star evolution, where the central pressure increases due to accretion or spin-down. Then, nucleation of the exotic (higher density) phase implies the formation of a core of the exotic phase and is accompanied by a core-quake and energy release. The possibility of developing the metastable core in the neutron star due to the evolutionary processes and the consequences of the core collapse are discussed.

References

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