On the stability of giant nuclei in supernova matter with respect to deconfinement

Kei Iida and Tsukiho Fujie

Department of Mathematics and Physics, Kochi University, Kochi 780-8520, Japan

The possibility that strange quark matter is the most stable self-bound system has been discussed for more than three decades. Recently, by using a phenomenological model that describes the spectra of the lightest pseudoscalar and scalar meson nonets, Holdom et al. [1] found that even two-flavor quark matter could be energetically more favorable. For mass number less than that of superheavy nuclei, however, beta-stable nuclei in vacuum were shown to escape decay into two-flavor quark matter.

In this work, we consider whether or not giant nuclei as encountered in supernova cores escape decay into two-flavor quark matter. Comparison of mass formulas for a nucleus and a *ud* quark droplet in a Wigner-Seitz cell suggests that in supernova cores, beta stable nuclei of mass number far larger than 300 are not always favored over *ud* quark droplets of the same mass and charge number. The role of the surface tension in this suggestion is clarified.

[1] B. Holdom, J. Ren, and C. Zhang, Phys. Rev. Lett. **120**, 222001 (2018).