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Inhomogeneous chiral symmetry breaking in isospin-asymmetric matter

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We investigate the phase structure of strong-interaction matter within a two-flavor Nambu–Jona-Lasinio model. For degenerate quark flavors it has already been shown that the appearance of chiral symmetry-breaking phases with spatially modulated order-parameters is possible. Since this might have significant consequences on the physics of compact stars, we analyze the emergence of these inhomogeneous phases in isospin asymmetric and charge neutral matter by allowing the order-parameter to be spatially modulated. We find that the formation of inhomogeneous chiral symmetry-breaking phases is still possible with an imbalance in the quark numbers. While enforcing equal quark periodicities, the appearance of such inhomogeneous phases is energetically disfavored in isospin asymmetric matter. However, by allowing unequal quark periodicities it is found that the inhomogeneous phase can be stabilized against the additional pairing stress.

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