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Unconventional magnetic ground state in strained graphene: theory of global anti-ferromagnetic phase FAKHER ASSAAD, Institut fur Theoretische Physik und Astrophysik, Universitat Wurzburg, Am Hubland, D-97074 Wurzburg, Germany, BITAN ROY, Condensed Matter Theory Center, Department of Physics, University of Maryland, College Park, Maryland 20742, USA, IGOR HERBUT, Department of Physics, Simon Fraser University, Burnaby, British Columbia, Canada, V5A 1S6 — An unconventional magnetic ground state is proposed for the Hubbard Hamiltonian in strained graphene. We show that when the chemical potential lies close to the Dirac point, strained graphene supports magnetic ordering that simultaneously gives rise to anti-ferromagnetic and ferromagnetic orders, even for weak onsite interaction. Whereas the anti-ferromagnetic order parameter is of the same sign in the entire system, the ferromagnetic order at the boundary has the opposite sign from the bulk. The spatially-integrated ferromagnetic order parameter is this way zero, and the magnetic ground state is therefore a spin-singlet. This peculiar magnetic ordering results from the nature of the strain-induced (near) zero energy states, which have support on one sublattice in the bulk, and on the other sublattice near the boundary of a finite system. We support our claim with the self-consistent numerical mean-field calculation of the magnetic order parameters, and with a Monte-Carlo simulations of the Hubbard model in a strained honeycomb lattice.

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