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**Midgap states and the fractional quantum Hall regime
in graphene quantum dots**¹

IGOR ROMANOVSKY, CONSTANTINE YANNOULEAS, UZI LANDMAN, School of Physics, Georgia Institute of Technology — Graphene quantum dots (QDs) with zigzag edges exhibit midgap single-particle states associated with such edges. At zero magnetic field (B), these states form a manifold of degenerate states similar to the lowest Landau level that forms in semiconductor QDs at high B . It has been recently suggested² that the midgap-state manifold in graphene dots can support correlated many-body states similar to the rotating-electron-molecule (REM) states (also referred to as rotating Wigner crystallites) that are well known in semiconductor QDs at high B .³ Here, we will report systematic exact-diagonalization calculations (for $N = 4 - 10$ QD electrons) describing the REM states in graphene QDs. We anticipate that the graphene REM states exhibit for all N a single polygonal ring of localized electrons, in contrast to the multiple polygonal-ring configurations known from semiconductor QDs.

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²B. Wunsch *et al.*, arXiv:0707.2948v2

³C. Yannouleas and U. Landman, Rep. Prog. Phys. **70**, 2067 (2007)

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Constantine Yannouleas
constantine.yannouleas@physics.gatech.edu
School of Physics, Georgia Institute of Technology

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