GRAPHENE NANORIBBONS: A KEY INGREDIENT FOR SOLID-STATE QUANTUM INFORMATION PROCESSING?

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9.7 cm

Graphene, an atomically-thin carbon monolayer, is a unique condensed-matter system which shows the features predicted by relativistic quantum mechanics [1]. Apart from merging the two rather distant fields of physics together, the world of graphene is also considered as a promissing environment for solid-state quantum computing. We review the existing theoretical proposals for physical realization of a qubit in graphene nanostructures [2,3,4] which were recently followed by a remarkable progress in nanoribbon fabrication [5]. The role of spontaneous magnetic order predicted for zigzag-edge ribbons [4] is stressed. Finally, we present the original proposal for building graphene quantum dots by trapping electrons with the help of sublattice-mismatch.

[1] A.K. Geim and K.S. Novoselov, *Nature Materials* **6**, 183 (2007).
[2] B. Trauzettel, D.V. Bulaev, D. Loss, and G. Burkard, *Nature Physics* **3**, 192 (2007).
[3] A. Rycerz, J. Tworzydło, and C.W.J. Beenakker, *Nature Physics* **3**, 172 (2007).
[4] M.Wimmer *et al.*, `arxiv:0709.3244`; S.Dutta *et al.*, *Phys. Rev. B* **77**, 073412 (2008).
[5] X. Li *et al.*, *Science* **319**, 1229 (2008).

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