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Possible nano-graphene devices having topology origin edge states KOICHI KUSAKABE, Graduate School of Engineering Science, Osaka University — In nanometer scale graphene structures, edge-localized surface states may appear in specified edges. Evidences of the edge states has been given by the ultra-high vacuum STM/STS observation of well-characterized edges of graphene structures.[1,2] The density functional theory supported both appearance of edge states and existence of localized magnetism in a characterized Hydrogenated graphene structure within the local-spin-density approximation.[3] In this study, we reconsider appearance of the edge states due to network topology of π orbitals of graphene, which is used in designed structures for nano-meter scale graphene-based devices. We consider graphene structures bridging two metallic Ni electrodes. For the Ni (111) surface, epitaxial growth of graphene is possible. We assume that the Ni electrode has a sharp straight edge. The interface between graphene and Ni structure creates a boundary condition for conducting electrons in the graphene, since it is known that a gap is formed in the electronic states of graphene pasted on Ni. The gap is much enhanced by fluorination of graphene on Ni. There are two types of boundary for the graphene structures, which may be classified into zigzag and Klein's edges. Thus, we can design a graphene-based magnetic FET structure with Ni electrodes by possible partial fluorination of graphene. First-principles electronic structure calculations for this structure is given. [1] Y. Kobayashi, K. Fukui, T. Enoki, K. Kusakabe and Y. Kaburagi, Phys. Rev. B 71, 193406-1-4 (2005). [2] Y. Kobayashi, K. Fukui, T. Enoki and K. Kusakabe, Phys. Rev. B 73, 125415-1-8 (2006). [3] K. Kusakabe and M. Maruyama, Phys. Rev. B 67, 092406-1-4 (2003).

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