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**Recovering edge states of graphene nanoislands on Ir(111) by silicon intercalations** LEI TAO, HUI CHEN, YANDE QUE, DONGFEI WANG, RUIZI ZHANG, WENDE XIAO, YU-YANG ZHANG, SHIXUAN DU, Chinese Academy of Sciences, SOKRATES PANTELIDES, Vanderbilt University, HONGJUN GAO, Chinese Academy of Sciences — It has been predicted by theory that free-standing graphene nanoribbons with zigzag edges have spin-polarized edge states with a promise for applications. However, it has been widely reported that graphene nanoislands (GNIs) on metal substrates have no states that are localized at zigzag edges because of interaction with substrate electrons. Here, we demonstrate that edge states of GNIs with zigzag edges on Ir(111) can be recovered by intercalating a layer of Si atoms between GNIs and the Ir substrate. Using scanning tunneling microscopy and spectroscopy, in combination with density functional theory calculations, we show that GNIs are effectively decoupled from the Ir substrate by the intercalated Si layer, leading to the recovery of edge states that were originally suppressed by graphene-substrate interaction. We also find that edge states gradually shift to the Fermi level with increasing lateral sizes of the GNIs. In addition, theoretical calculations show that edge states of some irregular GNIs are spin-polarized, which suggests an avenue for construction of graphene-based spintronic devices.

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