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Direct experimental evidence of π magnetism of a single atomic vacancy in graphene[1] YU ZHANG, SIYU LI, Beijing Normal University, HUAQING HUANG, Tsinghua University, WENTIAN LI, JIABIN QIAO, WENXIAO WANG, LONGJING YIN, KEKE BAI, Beijing Normal University, WENHUI DUAN, Tsinghua University, LIN HE, Beijing Normal University — The pristine graphene is strongly diamagnetic. However, graphene with single carbon atom defects could exhibit paramagnetism. Theoretically, the π magnetism induced by the monovacancy in graphene is characterizing of two spin-split density-of-states (DOS) peaks close to the Dirac point. Since its prediction, many experiments attempt to study this π magnetism in graphene, whereas, only a notable resonance peak has been observed around the atomic defects, leaving the π magnetism experimentally so elusive. Here, we report a direct experimental evidence of the π magnetism by using scanning tunneling microscope. We demonstrate that the localized state of the atomic defects is split into two DOS peaks with energy separations of several tens meV. Strong magnetic fields further increase the energy separations of the two spin-polarized peaks and lead to a Zeeman-like splitting. Unexpectedly, the effective g-factor around the atomic defect is measured to be about 40, which is about twenty times larger than the g-factor for electron spins.

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