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Direct observation of ordered configurations of hydrogen adatoms on graphene CHENFANG LIN, YEXIN FENG, YINGDONG XIAO, Peking Univ., MICHAEL DUERR, Justus Liebig University Giessen, XIANGQIAN HUANG, XIAOZHI XU, RUGUANG ZHAO, ENGE WANG, XIN-ZHENG LI, ZONGHAI HU, Peking Univ. — Ordered configurations of hydrogen adatoms on graphene have received great attention because they are closely tied to tuning of graphene properties including large band gap opening and formation of specific magnetic orders, both of which are highly desirable in potential applications. Many ordered structures of hydrogenated graphene have been proposed, including double sided and single sided ones, with the calculated band gap width depending on the respective H coverage. However, none of these ordered structures has been observed directly. Here we report direct imaging of several ordered configurations of H adatoms on graphene by scanning tunneling microscopy. The H atoms in the configurations exhibit apparent sublattice selectivity and tiny deviations from the exact atop-of-carbon positions. Scanning tunneling spectroscopy measurements of the configurations showed a larger than 0.6 eV gap in the local density of states. These findings can be well explained by our density functional theory simulations based on models of double sided H configurations.

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