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Tunable Anderson Localization in Hydrogenated Graphene Based on the Electric Field Effect: First-Principles Study[1] JOONGOO KANG, SUHUAI WEI, National Renewable Energy Laboratory — We present a mechanism for reversible switching of the Anderson localization (AL) of electrons in hydrogenated graphene through modulation of the H coverage on graphene by external electric fields. The main idea is to exploit the unique acid-base chemistry (i.e., proton transfer reaction) between NH_3 gas and hydrogenated graphene, which can be controlled by applying perpendicular electric fields. The proposed field-induced control of disorder in hydrogenated graphene not only has scientific merits in a systematic study of AL of electrons in grapheme but can also lead to new insight into the development of a new type of transistor based on reversible on/off switching of AL. Furthermore, the reversible and effective tuning of the H coverage on graphene should be useful for tailoring material properties of weakly hydrogenated graphene.

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