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Anisotropic Hydrogen Etching of Chemical Vapor Deposited Graphene YI ZHANG, ZHEN LI, LUYAO ZHANG, PYOJAE KIM, CHONGWU ZHOU, University of Southern California — In terms of the preparation of graphene, chemical vapor deposition (CVD) has raised its popularity as a scalable and cost effective approach for graphene synthesis. While the formation of graphene on copper foil has been intensively studied, the reverse reaction of graphene reacts with hydrogen has not been systematically studied. In this talk we will present a simple, clean, and highly anisotropic hydrogen etching method for CVD graphene catalyzed by the copper substrate. By exposing CVD graphene on copper foil to hydrogen flow around 800 °C, we observed that the initially continuous graphene can be etched to have many hexagonal openings. In addition, we found that the etching is temperature dependent and the etching of graphene at 800 ∘C is most efficient and anisotropic. 80% of the angles of graphene edges after etching are 120°, indicating the etching is highly anisotropic. No increase of D band along the etched edges indicates that the crystallographic orientation of etching is zigzag direction. Furthermore, we observed that copper played an important role in catalyzing the etching reaction, as no etching was observed for graphene transferred to Si/SiO_2 under similar conditions. This highly anisotropic hydrogen etching technology may work as a simple and convenient way to determine graphene crystal orientation and grain size, and may enable the etching of graphene into nanoribbons for electronic applications.

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