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Spatially Resolving Spin-split Edge States of Chiral Graphene Nanoribbons[1]

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A central question in the field of graphene-related research is how graphene behaves when it is patterned at the nanometer scale with different edge geometries. The most fundamental shape in this regard is the graphene nanoribbon (GNR), a narrow strip of graphene that is characterized by its width and chirality. GNRs have been predicted to exhibit a wide range of behavior that includes tunable energy gaps and unique 1D edge states with unusual magnetic structure. I will discuss a scanning tunneling microscopy and spectroscopy (STS) study of GNRs that allows us to examine how GNR electronic structure depends on the chirality of atomically well-defined GNR edges. Our STS measurements reveal the presence of 1D GNR edge states that closely match theoretical expectations for GNRs of similar width and chirality. We additionally observe width-dependent energy splitting in GNR edge states, providing compelling evidence of their magnetic nature.

[1]This work performed in collaboration with Chenggang Tao, Liying Jiao, Oleg V. Yazyev, Yen-Chia Chen, Juanjuan Feng, Xiaowei Zhang, Rodrigo B. Capaz, James M. Tour, Alex Zettl, Steven G. Louie, and Hongjie Dai.