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Momentum-Space Imaging of the Dirac Band Structure in Molecular Graphene via Quasiparticle Interference[1] ANNA STEPHENSON, KENJIRO K. GOMES, University of Notre Dame, WONHEE KO, WARREN MAR, HARI C. MANOHARAN, Stanford University — Molecular graphene is a nanoscale artificial lattice composed of carbon monoxide molecules arranged one by one, realizing a dream of exploring exotic quantum materials by design. This assembly is done by atomic manipulation with a scanning tunneling microscope (STM) on a Cu(111) surface. To directly probe the transformation of normal surface state electrons into massless Dirac fermions, we map the momentum space dispersion through the Fourier analysis of quasiparticle scattering maps acquired at different energies with the STM. The Fourier analysis not only bridges the real-space and momentum-space data but also reveals the chiral nature of those quasiparticles, through a set of selection rules of allowed scattering involving the pseudospin and valley degrees of freedom. The graphene-like band structure can be reshaped with simple alterations to the lattice, such as the addition of a strain. We analyze the effect on the momentum space band structure of multiple types of strain on our system.

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Anna Stephenson
University of Notre Dame

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