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Electric Field Control of Stacking-Order Solitons in Trilayer Graphene MATTHEW YANKOWITZ, University of Arizona, JOEL I-JAN WANG, Massachusetts Institute of Technology, A. GLEN BIRDWELL, US Army Research Laboratory, K. WATANABE, T. TANIGUCHI, National Institute for Materials Science, PABLO SAN-JOSE, Instituto de Ciencia de Materiales de Madrid, PHILIPPE JACQUOD, University of Arizona, PABLO JARILLO-HERRERO, Massachusetts Institute of Technology, BRIAN J. LEROY, University of Arizona — Trilayer graphene exhibits two low-energy stacking configurations (Bernal and rhombohedral). In graphene flakes with both stacking configurations, the area separating them consists of a localized soliton-like region of strain where one graphene layer shifts by the carbon-carbon bond distance. Under a perpendicular electric field, Bernal-stacked trilayer graphene remains metallic whereas rhombohedrally-stacked trilayer graphene develops a band gap. Consequentially, the electric field modifies the relative energy cost of each stacking configuration, permitting rare control over the crystal structure of a material via only the application of an external electric field. We demonstrate the ability to control the stacking configuration in trilayer graphene via an electric field using scanning tunneling microscopy.

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