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Imaging of Bottom-up Graphene Nanoribbons Synthesized Using Combined Solution and Surface Reactions DANNY HABERER, CHEN CHEN, ZAHRA PEDRAMRAZI, RYAN CLOKE, TOMAS MARANGONI, WON-WOO CHOI, FELIX FISCHER, CROMMIE MICHAEL, UC Berkeley, CROMMIE GROUP TEAM, FISCHER GROUP TEAM — Bottom-up graphene nanoribbons (GNRs) are a new class of material that has promising applications in next-generation electronic, spintronic, and optical devices. Bottom-up synthesis using molecular precursors provides precise control over GNR width and edge geometry, which determine GNR electronic structure. However, previously used on-surface polymerization techniques can be hindered by molecular diffusion barriers and by undesired side products. Alternative in-solution polymerization techniques potentially have better yield and higher selectivity. Using combined in-solution polymerization and on-surface cyclodehydrogenation reactions, we have successfully synthesized N=9 armchair GNRs. Scanning tunneling microscopy was used to reveal the precise width and edges of the resulting nanoribbons. This method may be generalized to synthesize graphene nanoribbons that are difficult to fabricate through exclusive on-surface reactions.

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