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Synthesis of Graphene Nanoribbons by Covalent Assembly of Monomers SUMIT BENIWAL, MIKHAIL SHEKHIREV, TIMOTHY VO, DONNA KUNKEL, ALEXANDER SINITSKII, AXEL ENDERS, University of Nebraska - Lincoln — We present bottom up approach for synthesis of graphene nanoribbons on Ag (111) from monomers using scanning tunneling microscopy, photoemission, ultraviolet and Raman spectroscopy. In this study we used N-modified precursor molecules to form graphene nanoribbons by thermal evaporation on Ag (111) under UHV conditions. Of particular interest is the role of substrate temperature, which catalyses the polymerization and de-hydrogenation of the precursor molecules. The catalytic nature of the surface is demonstrated by the fact the polymerization happens only in the first layer monomers while the second layer monomers remain as individuals. The orientation of these ribbons with respect to substrate can be controlled by the structure of the monomers. Instead of lying flat on Ag (111) surface, nanoribbons form π-stacked networks and they stand up tilted with respect to substrate surface. This type of arrangement is attributed to the replacement of two carbon atoms in the precursor molecules with nitrogen atoms. Our approach not only bolsters previously demonstrated bottom up fabrication of graphene nanoribbons but also provides additional insight into manipulation of their orientation on substrate surface by modifying the edge of precursor monomers.

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