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A structural and electronic comparison of armchair and zigzag epitaxial graphene sidewall nanoribbons MEREDITH NEVIUS, F. WANG, Georgia Tech, I. PALACIO, A. CELIS, SOLEIL, A. TEJEDA, A. TALEB-IBRAHIMI, CNRS/SOLEIL, W. DE HEER, Georgia Tech, C. BERGER, CNRS/Georgia Tech, E. CONRAD, Georgia Tech — Graphene grown on sidewalls of trenches etched in SiC shows particular promise as a candidate for post-Si CMOS electronics because of its ballistic transport, exceptional mobilities, low intrinsic doping, and the opening of a large band gap. [1,2] However, before definitive progress can be made toward epitaxial graphene-based transistors, we must fully understand the nuances of graphene ribbon growth on different SiC facets. We have now confirmed that sidewall ribbons grown in graphene's two primary crystallographic directions ("armchair" and "zigzag") differ greatly in both structure and electronic band-structure. We present data from both geometries obtained using low-energy electron microscopy (LEEM), low-energy electron diffraction (LEED), angle-resolved photoemission spectroscopy (ARPES), photoemission electron microscopy (PEEM), micro-ARPES and dark-field micro-ARPES. We demonstrate that while graphene grows on stable facets of trenches oriented for armchair edge growth, trenches oriented for zigzag edge growth prefer narrow ribbons of graphene on the (0001) surface near the trench edge. The structure of these zigzag edge graphene ribbons is complex and paramount to understanding their transport. [1] J. Baringhaus et al. arXiv:1301.5354 Nature to be published [2] J. Hicks et al. Nature Physics (2012). This work was supported by the NSF under grants DMR-1005880 and DMR-0820382, the W. M. Keck Foundation and the Partner University Fund from the Embassy of France.

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