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Scanning tunneling microscopy and spectroscopy of wet chemically synthesized porous graphene nanoribbons**Kaitlyn Parsons¹, Adrian Radocea¹, Mohammad Mehdi Pour², Tao Sun¹, Narayana Aluru¹, Alexander Sinitskii² and Joseph W Lyding¹**¹University of Illinois at Urbana-Champaign, USA²University of Nebraska-Lincoln, USA

The bottom-up wet chemical synthesis of Graphene Nanoribbons (GNRs) opens interesting opportunities for tailoring the GNR structure with atomic precision. Atomically precise porous GNRs are a new chemically synthesized variation for which the fabrication procedures yielding multiple pores in a single ribbon and the electronic details of the ribbon have not been reported. In this study, porous GNRs are dry contact transferred in ultrahigh vacuum to clean silicon and III-V semiconducting substrates and examined using UHV Scanning Tunneling Microscopy (STM) and Spectroscopy (STS). STM imaging confirms the expected porous structure and indicates a unique electronic feature at the graphene nanopores and STS measurements indicate a 2.0 eV band gap. These results are compared to first-principles DFT simulations in which an increased local density of states at the pores is predicted. A GW correction predicts a 2.89 eV band gap. Illumination of pore effects in GNRs contributes to an increased understanding of the tunability of GNR electronic structure. Porous GNRs have potential applications in molecular filtration, detection and DNA sequencing.

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