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Influence of Chemisorbed Oxygen on the Growth of Graphene on Cu(100) by Chemical Vapor Deposition[1] ENG WEN ONG, TYLER R. MOWLL, PARUL TYAGI, CARL A. VENTRICE, JR., SUNY College of Nanoscale Science and Engineering, ZACHARY R. ROBINSON, D. KURT GASKILL, U.S. Naval Research Laboratory, HEIKE GEISLER, SUNY College at Oneonta — The growth of graphene by catalytic decomposition of ethylene in a UHV chamber on both a clean Cu(100) surface and a Cu(100) surface predosed with a layer of chemisorbed oxygen has been studied. The crystal structure of the graphene films was characterized with in-situ LEED. By heating the clean Cu(100) substrate from room temperature to the growth temperature in ethylene, epitaxial graphene films were formed. The crystal quality was found to depend strongly on the growth temperature. At 900 °C, well-ordered two-domain graphene films were formed. Predosing the Cu(100) surface with a chemisorbed layer of oxygen before graphene growth was found to adversely affect the crystal quality of the graphene overlayer by inducing a much higher degree of rotational disorder of the graphene grains with respect to the Cu(100) substrate. The growth morphology of the graphene islands during the initial stages of nucleation was monitored with ex-situ SEM. The nucleation rate of the graphene islands was observed to drop by an order of magnitude by predosing the Cu(100) surface with a chemisorbed oxygen layer before growth. Therefore, the presence of oxygen during graphene growth affects both the relative orientation and average size of grains within the films grown on Cu(100) substrates.

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Carl A. Ventrice, Jr.
SUNY College of Nanoscale Science and Engineering

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