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Effect of Oxygen on Sublimation Growth of Graphene on C-face SiC[1] ZACHARY ROBINSON, GLENN JERNIGAN, KONRAD BUSSMANN, MARC CURRIE, RACHAEL MYERS-WARD, VIRGINIA WHEELER, U.S. Naval Research Laboratory, LUKE NYAKITI, Texas A&M, SATOSHI OIDA, JAMES HANNON, IBM T.J. Watson Research Laboratory, CHIP EDDY, D. KURT GASKILL, U.S. Naval Research Laboratory — Graphene grown on Si-face SiC has demonstrated improved thickness uniformity when formed in an argon environment. For C-face growth, expected to yield graphene with superior electronic properties, similar progress has not yet been achieved. A systematic study of C-face SiC surface preparation and graphene growth in an argon environment has been carried out in a high temperature chemical vapor deposition system modified for low pressure sublimation. For all growth conditions investigated, the resulting graphene films were found to have non-uniform thickness. Further, x-ray photoelectron spectroscopy (XPS) measurements reveal significant amounts of oxygen on the surface, which has been suggested to cause the non-uniformity [1]. Thus, a sample was transferred to an ultra-high vacuum (UHV) system equipped with in situ XPS, where a UHV anneal of 1200°C was shown to be necessary to desorb the oxygen. Post-anneal exposure to atmospheric conditions resulted in the return of only 20% of the original oxygen concentration, suggesting that a robust oxide may be present during growth. Preliminary low energy electron micscoscopy results confirm that trace amounts of oxygen significantly affects the graphene growth process.

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