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Low Temperature Synthesis of Graphene on Cu(111) from CH4 via Chemical Vapor Deposition ROBERT JACOBBERGER, FENG XU, MENG-YIN WU, MICHAEL ARNOLD, University of Wisconsin-Madison — We report the low temperature CVD synthesis of high-quality, monolayer graphene on epitaxial Cu(111) thin films. The growth temperature of 750 ° C used in this work is around 150 °C lower than previous reports of continuous graphene growth using CH4 as the carbon precursor. Conditions that yield continuous films on Cu(111) result in sub-monolayer coverage on Cu(110) and Cu(100). This demonstrates that Cu(111) is a more effective graphene catalyst than Cu(100), which is predominately used in literature. The single crystal orientation of the Cu(111) thin films allows us to control the graphene orientation over large areas. Field effect measurements show ambipolar carrier behavior and electron and hole mobilities of 2500 cm^2/Vs. The Dirac point is near 0 V and the sheet resistance is 2 $k\Omega/\square$. Raman imaging reveals a negligible D:G ratio, indicating a low level of defects in these samples. We find that the graphene becomes more defective on all Cu facets with increasing growth rate. Optical transmittance of 97% over the visible spectrum confirms that the graphene is monolayer. This low temperature synthesis will help enable industrial scale fabrication of high-quality, continuous graphene films.

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