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Controlled Structural Strain in Epitaxial Graphene Layers on 6H-SiC and Effects on Surface Morphology NICOLA FERRALIS, University of California at Berkeley, JASON KAWASAKI, Princeton University, ROYA MABOUDIAN, CARLO CARRARO, University of California at Berkeley — The early stages of epitaxial graphene layer growth on the Si-terminated 6H-SiC(0001) are investigated by depolarized Raman spectroscopy and electron channeling contrast imaging. The selection of the depolarized component of the scattered light results in a significant increase in the C=C bond signal over the second order SiC Raman signal, which allows us to resolve submonolayer growth, the formation of the buffer layer and a strained graphene layer. The linear strain, measured at room temperature (RT), is found to be compressive, which can be attributed to the large difference between the coefficients of thermal expansion of graphene and SiC. Whereas film thickness is determined by growth temperature only, the magnitude of the compressive strain and film morphology can be varied by adjusting the growth time at fixed annealing temperature. Annealing times in excess of 8-10 minutes lead to an increase in the mean square roughness of SiC step edges to which graphene films are pinned, resulting in compressively stressed films at RT. Shorter annealing times produce minimal changes in the morphology of the terrace edges and result in nearly stress-free films upon cooling to RT.

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