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Raman Measurements of Thermal Transport in Suspended Monolayer Graphene of Variable Sizes in Vacuum and Gaseous Environments SHANSHAN CHEN, ARDEN MOORE, WEIWEI CAI, JI WON SUK, JINHO AN, COLUMBIA MISHRA, CHARLES AMOS, CARL MAGNUSON, University of Texas at Austin, JUNYONG KANG, Xiamen Universiy, Xiamen, China, LI SHI, RODNEY RUOFF, University of Texas at Austin, XIAMEN UNIVERSITY TEAM — Using micro-Raman spectroscopy, the thermal conductivity of a graphene monolayer grown by chemical vapor deposition and suspended over holes with different diameters ranging from 2.9 to 9.7 μm was measured in vacuum, thereby eliminating errors caused by heat loss to the surrounding gas. The obtained thermal conductivity values of the suspended graphene range from (2.6$\pm$0.9) to (3.1$\pm$1.0)$\times 10^3 \mathrm{Wm}^{-1}\mathrm{K}^{-1}$ near 350 K without showing the sample size dependence predicted for suspended, clean, and flat graphene crystal. The lack of sample size dependence is attributed to the relatively large measurement uncertainty as well as grain boundaries, wrinkles, defects, or polymeric residue that are possibly present in the measured samples. Moreover, from Raman measurements performed in air and CO_2 gas environments near atmospheric pressure, the heat transfer coefficient for air and CO_2 was determined and found to be (2.9+5.1/-2.9) and (1.5+4.2/-1.5)$\times 10^4 \mathrm{Wm}^{-2}\mathrm{K}^{-1}$, respectively, when the graphene temperature was heated by the Raman laser to about 510 K.

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