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Heat Dissipation from Suspended Carbon Nanotubes to their Surrounding Gas Environment I. KAI HSU, MICHAEL T. PETTES, MEHMET AYKOL, LI SHI, STEPHEN CRONIN — The assistance of gas molecules to dissipate heat in 5-μm-long, electrical heated suspended carbon nanotubes (CNTs) is observed by comparing the *G*band Raman phonon temperature profiles measured in different gas environments and in vacuum. The measurement results show that 50-60% of the heat generated in the CNT is carried away by its surrounding gas molecules. By analyzing the temperature profiles investigated in different gases, the thermal boundary conductance (TBC) between the gas molecules and the CNT can also be extracted. We find the TBC to be higher in carbon dioxide than in nitrogen, argon and helium.[1] Moreover, we report another optical method to explore the heat spreading behavior on a longer suspended CNTs in air, in which one laser is used as a heat source while another laser is used as a local temperature probe. A fin-shape thermal transport model is applied to fit the exponentially decaying temperature profiles measured away from the heat source. These results yield a heat decay length and TBC for air to be around 6.5 μm and 3×10^5 W/m^2 •K, respectively.

[1]I Kai Hsu *et al. Journal of Applied Physics* **2010,** 108, (084307).

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