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Can carbon nanotubes be used in heat transfer applications?

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The ever increasing demand for smaller devices (miniaturization) makes the need for nanodevices ever more apparent. However, cooling these devices is becoming ever more difficult and energy demanding. Therefore, we investigate the potential of carbon nanotubes (CNTs) for use as nano heat pipes. The aim of this work is to determine the effect of liquid filling on the thermal conductivity of CNTs. To that end, a platinum nanosensor was fabricated and placed inside a scanning electron microscope (SEM) chamber. With the use of a manipulator a CNT was mounted/suspended directly on the sensor. The thermal behaviour of the system with CNTs of different sizes and thicknesses were evaluated first as a baseline. Then, liquid was inserted in the CNTs and their thermal behaviour was determined. We report the first, to the best of our knowledge, direct measurement of filled CNTs thermal conductivity.