Thermal conductivity characterization of vertically-aligned single-walled carbon nanotube films

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Over the last decade, the expectation on single-walled carbon nanotubes (SWNTs) to possess high thermal conductivity has attracted number of researches. While many numerical simulation works have been reported on the details of the thermal conductivity characteristics, the number of experimental works has been limited mainly due to the difficulties in handling nanoscale materials. In this study, by using high purity VASWNT films grown by alcohol catalytic chemical vapor deposition (ACCVD) method, thermal properties of VASWNT films have been experimentally characterized. Compared to measurements of isolated SWNTs, the measurement of the bulk material reduces the technical difficulties. A VASWNT film is an attractive candidate for next generation thermal interface materials. The 3-omega method is employed to measure thermal conductivity of VASWNT films. Particular attention is paid to the dependence of the thermal conductivity on the geometry of VASWNTs. The geometry variation is realized by altering the CVD synthesis conditions. We also investigate the thermal

boundary resistance between the metal electrode and the VASWNT film, which becomes important in device application. The metal kind is varied in order to investigate the metal dependence of the thermal boundary resistance. The results are discussed in connection with the morphologies of the metal deposition layers.