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Microstructural design and evaluation of thermally conductive polymer composites containing nano and micro fillers

Thermally conductive polymer composites offer new possibilities for the thermal management in electronic devices. An approach of current interest to improve the thermal conductivity of polymer composites is the addition of hybrid nano and micro fillers with high thermal conductivity. The objective of this paper is to study the effective thermal conductivity of the composites with nano and micro fillers. The nano fillers used were carbon nanotubes and alumina nanowires, and the alumina and boron nitride particles with different shape and size were selected as the micro fillers. The random close-packed structures of micro fillers were obtained using packing simulations, and finite element analyses were performed to predict the composite thermal conductivity. In addition, experimental measurements of the thermal conductivity of the manufactured polymer composites were carried out by using a steady-state method. The microstructure of the composites was also examined using a scanning electron microscope. The results showed that the addition of nano fillers to the matrix significantly increased the thermal conductivity of the composites with close-packed structure of micro fillers.

Speaker Biography

Dr. Kazuaki Sanada received his Doctor of Engineering from Tohoku University in 1999. From 1999 until 2003 he worked as a researcher at Hitachi, Ltd. He is currently a professor in the Department of Mechanical Systems Engineering at Toyama Prefectural University, which he joined in 2003. Dr. Sanada is primarily interested in the fabrication and evaluation of carbon nanotube/polymer composites, the microstructural design and characterization of thermally conductive polymer composites, and the development of self-healing composites.

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