**Abstract**

The effect of multiwall carbon nanotubes (MWCNTs) and magnesium oxide (MgO) on the thermal conductivity of MWCNTs and MgO-reinforced silicone rubber was studied. The increment of thermal conductivity was found to be linear with respect to increased loading of MgO. In order to improve the thermal transportation of phonons 0.3 wt % and 0.5 wt % of MWCNTs were added as filler to MgO-reinforced silicone rubber. The MWCNTs were functionalized by hydrogen peroxide (H2O2) to activate organic groups onto the surface of MWCNTs. These functional groups improved the compatibility and adhesion and act as bridging agents between MWCNTs and silicone elastomer, resulting in the formation of active conductive pathways between MgO and MWCNTs in the silicone elastomer. The surface functionalization was confirmed with XRD and FTIR spectroscopy. Raman spectroscopy confirms the pristine structure of MWCNTs after oxidation with H2O2. The thermal conductivity is improved to 1 W/m·K with the addition of 20 vol% with 0.5 wt % of MWCNTs, which is an ~8-fold increment in comparison to neat elastomer. Improved thermal conductive properties of MgO-MWCNTs elastomer composite will be a potential replacement for conventional thermal interface materials.

*Keywords:*[**thermal conductivity**](https://www.mdpi.com/search?q=thermal%20conductivity); [**silicone elastomer**](https://www.mdpi.com/search?q=silicone%20elastomer); [**multi-wall carbon nanotubes**](https://www.mdpi.com/search?q=multi-wall%20carbon%20nanotubes)