Electromagnetic shielding and thermal properties of polymer nanocomposites based on nanocarbon as a filler

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Nowadays, electronic devices often need high powers and their packing density is high. The aftermath of this is malfunctioning regarding electromagnetic disturbances and overheating. So, the critical issues concerning modern electronic device's operation are the efficiency of the excess heat dissipation and electromagnetic shielding.

Traditionally and usually, electromagnetic shielding is achieved by using heavy, corrosive, and expensive metals [1]. On the other hand, the heat dissipation has to be solved by using a completely different material (called TIM, Thermal Interface Materials), possessing no EMI shielding properties [2]. Consequently, a user needs to use two various systems to protect its device.

Here, we propose a novel solution combining as well an EMI shield screen and efficient heat dissipation in one carbon-based polymer nanocomposite. We show the complementary studies of shielding efficiency in X-band, thermal properties measurements such as thermal conductivity, electrical properties as volume/sheet resistance, and structure analysis.

Depending on the polymer matrix, we achieved EMI efficiency up to 40 dB, thermal conductivity up to over 3 W/mK, volume resistance below 1 Ωcm. The results give the solid base to claim, we can produce using a very simple method multifunctional material, that could be transferred to industry and be competitive to the traditional materials.

References

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