Thermally Conductive Shape Memory Polymer Composites Filled with Boron Nitride for Heat Management in Electrical Insulation

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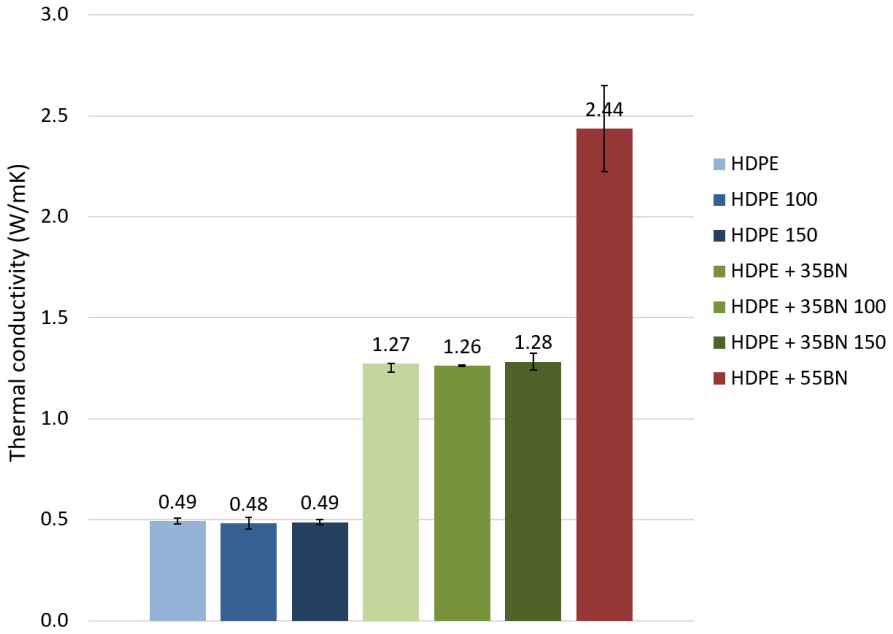
The evaluation of a possible application of functional shrinkable materials in thermally conductive electrical insulation elements was investigated. The effectiveness of an electron beam and gamma radiation on the crosslinking of a selected high density polyethylene grade was analyzed, both qualitatively and quantitatively. The crosslinked polymer composites filled with ceramic particles were successfully fabricated and tested. On the basis of the performed investigation, it was concluded that the selected filler, namely a boron nitride powder, is suitable for the preparation of the crosslinked polymer composites with enhanced thermal conductivity. The shape memory effect was fully observed in the crosslinked samples with a recovery factor reaching nearly 99% [1]. There was no significant influence of the crosslinking, stretching, and recovery of the polymer composite during shape memory phenomenon on the value of thermal conductivity. The proposed boron nitride filled polyethylene composite subjected to crosslinking is a promising candidate for fabrication of thermally shrinkable material with enhanced heat dissipation functionality for application as electrically insulating components.



Thermal conductivity values measured perpendicularly to injection molding direction for samples with different content of the BN filler: 0, 35, and 55 wt.%. Results are shown for reference pristine samples and samples after testing shape memory effect. Bars with standard deviation are indicated for each type of specimen.

Keywords: shape memory; polymer composites; thermally shrinkable materials; thermal conductivity; electrical insulation

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References

[1] Rybak, A.; Malinowski, L.; Adamus-Wlodarczyk, A.; Ulanski, P. Thermally Conductive Shape Memory Polymer Composites Filled with Boron Nitride for Heat Management in Electrical Insulation. *Polymers* **2021**, *13*, 2191.