

## Accepted Manuscript

Largely enhanced thermal conductivity of HDPE/ boron nitride /carbon nanotubes ternary composites via filler network-network synergy and orientation

Junjin Che, Mengfan Jing, Dingyao Liu, Ke Wang, Qiang Fu

PII: S1359-835X(18)30195-7  
DOI: <https://doi.org/10.1016/j.compositesa.2018.05.016>  
Reference: JCOMA 5041

To appear in: *Composites: Part A*

Received Date: 24 March 2018

Revised Date: 10 May 2018

Accepted Date: 16 May 2018

Please cite this article as: Che, J., Jing, M., Liu, D., Wang, K., Fu, Q., Largely enhanced thermal conductivity of HDPE/ boron nitride /carbon nanotubes ternary composites via filler network-network synergy and orientation, *Composites: Part A* (2018), doi: <https://doi.org/10.1016/j.compositesa.2018.05.016>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



# Largely enhanced thermal conductivity of HDPE/ boron nitride /carbon nanotubes ternary composites via filler network-network synergy and orientation

Junjin Che, Mengfan Jing, Dingyao Liu, Ke Wang, Qiang Fu\*

*College of Polymer Science and Engineering, State Key Laboratory of Polymer Materials Engineering, Sichuan University, Chengdu 610065, China.*

**Abstract:** In recent years, hybrid fillers with different dimension are frequently used to improve the thermal conductivity of polymer/filler composites. While the combined effect of hybrid filler and orientation on the thermal conductivity of polymer/filler composites has rarely reported. In this work, high density polyethylene (HDPE)/ boron nitride (BN)/carbon nanotubes (CNT) ternary composites were prepared by melt blending then hot rolled to obtain oriented sheets. The thermal conductivity and internal structure of the obtained sheets were investigated and compared with those obtained by hot-pressed sheets with random distributed structure. Two representative systems were used, the one is that BN content is low and forms the isolated dispersions (using HDPE/5BN/CNT composites with 5wt% of BN as example), the other one is that BN content is high and forms network structure (using HDPE/25BN/CNT composites with 25wt% of BN as example). For hot-pressed samples, no synergy between BN and CNT was found for HDPE/5BN/CNT system with BN dispersed in isolation in HDPE matrix, while an obvious increase of thermal conductivity was seen for HDPE/25BN/CNT system with BN network formation in HDPE matrix, and a 300% increase of thermal conductivity could be achieved as 3wt% of CNT was added, compared with that of net HDPE. For hot-rolled samples, an increase of thermal conductivity was observed for both HDPE/5BN/CNT and HDPE/25BN/CNT ternary composites by adding CNT into the composites, suggesting the importance of filler orientation in the enhancement of thermal conductivity in polymer/filler composites with hybrid filler. The combined effect of hybrid filler and orientation could result in a further increase of thermal conductivity and 600% increase of thermal conductivity could be achieved. Finally, based on the analysis of internal structure of prepared samples as obtained by SEM observation, rheology and XRD measurements, a possible mechanism for the enhancement of thermal conductivity via hybrid and orientation was proposed. Our work is important and could shed light for the preparation of polymer composites with super thermal conductivity.

**Keywords:** A. Polymer-matrix composites (PMCs); B. Electrical properties; B. Thermal properties

Download English Version:

<https://daneshyari.com/en/article/7889332>

Download Persian Version:

<https://daneshyari.com/article/7889332>

[Daneshyari.com](https://daneshyari.com)