Accepted Manuscript

Relationship between electrical conductivity and spatial arrangements of carbon nanotubes in polystyrene nanocomposites: The effect of thermal annealing and plasticization on electrical conductivity

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PII: S0266-3538(16)31177-0

DOI: 10.1016/j.compscitech.2017.04.020

Reference: CSTE 6750

To appear in: *Composites Science and Technology*

Received Date: 8 September 2016

Revised Date: 14 March 2017

Accepted Date: 14 April 2017

Please cite this article as: Fei G, Gong Q, Li D, Lavorgna M, Xia H, Relationship between electrical conductivity and spatial arrangements of carbon nanotubes in polystyrene nanocomposites: The effect of thermal annealing and plasticization on electrical conductivity, *Composites Science and Technology* (2017), doi: 10.1016/j.compscitech.2017.04.020.

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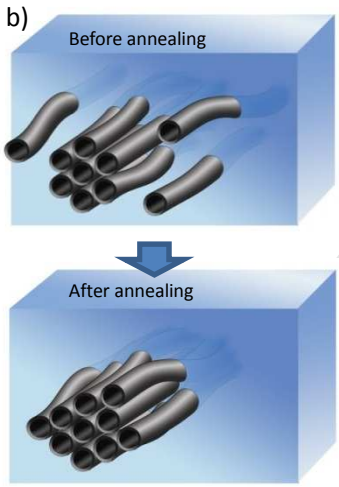
Paragraph abstract

The effect of both thermal annealing and plasticization of the polymeric matrix by low molecular weight compounds on the electrical conductivity of the polystyrene based carbon nanotubes (CNTs) composites were investigated. It was found that the electrical conductivity of the samples filled with 3 wt% of CNTs increased by nearly 2 orders of magnitude after thermal annealing for 10 h at 150℃, and it further increased with increasing plasticizer content. The effect of the hierarchical CNT morphology on the electrical conductivity of composites was elucidated by *in-situ* Raman and Synchrotron Radiation Small Angle X-ray Scattering investigations. The synergistic effect between thermal treatment and matrix plasticization contributes to efficiently eliminate the residual stress at the interface between polymeric matrix and carbon nanotubes. This leads to the formation of a more effective CNTs network featured by more dense bundles, exhibiting a larger number of contacts between the CNTs which contributes to significantly enhance the electrical conductivity of composites.



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