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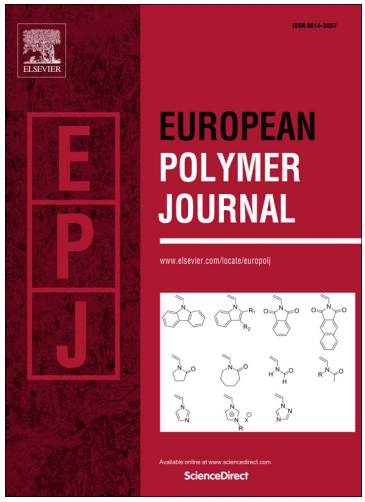


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PII: S0014-3057(17)30062-9
DOI: http://dx.doi.org/10.1016/j.eurpolymj.2017.02.044
Reference: EPJ 7746

To appear in: *European Polymer Journal*

Received Date: 12 January 2017
Revised Date: 23 February 2017
Accepted Date: 28 February 2017

Please cite this article as: Cheng, J., Pu, H., Influences of Matrix Viscosity on Alignment of Multi-Walled Carbon Nanotubes in One-Dimensional Confined Space, *European Polymer Journal* (2017), doi: http://dx.doi.org/10.1016/j.eurpolymj.2017.02.044

**Original Paper**

# Influences of Matrix Viscosity on Alignment of Multi-Walled Carbon Nanotubes in One-Dimensional Confined Space

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## ABSTRACT

The effects of matrix viscosity on alignment of multi-walled carbon nanotubes (MWCNTs) and physical properties of high density polyethylene (HDPE)/MWCNTs composite nanofibers via nanolayer coextrusion are studied. The alignment states are altered depending upon the matrix viscosity of the composite nanofibers. The morphology and nano-sized diameter of the nanofibers are observed on scanning electron microscope. To characterize the prioritized alignment and dispersion of MWCNTs in the matrix, transmission electron microscopy, polarized Raman spectra, and high resolution optical microscopy are used. It is found that the alignment of MWCNTs in higher viscosity matrix of the nanofibers is better than that in lower viscosity. The aligned MWCNTs composite nanofibers have smaller slope variations of rheological curves with increasing content of MWCNTs. In addition, the higher aligned HDPE/MWCNTs composite nanofibers exhibit higher decomposition temperature and enhanced mechanical properties. However, the poorly aligned nanofibers have higher electrical and thermal conductivities due to the easily formed three-dimensional network.

**KEYWORDS:** Nanolayer coextrusion; multi-walled carbon nanotubes; high density polyethylene; nanofiber; alignment.