

Accepted Manuscript

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PII: S1359-835X(18)30135-0
DOI: <https://doi.org/10.1016/j.compositesa.2018.03.033>
Reference: JCOMA 4990

To appear in: *Composites: Part A*

Received Date: 2 November 2017
Revised Date: 4 March 2018
Accepted Date: 24 March 2018

Please cite this article as: Rae Han, N., Whan Cho, J., Effect of click coupled hybrids of graphene oxide and thin-walled carbon nanotubes on the mechanical properties of polyurethane nanocomposites, *Composites: Part A* (2018), doi: <https://doi.org/10.1016/j.compositesa.2018.03.033>



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Effect of click coupled hybrids of graphene oxide and thin-walled carbon nanotubes on the mechanical properties of polyurethane nanocomposites

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ABSTRACT

Covalently bonded hybrids (GO-click-TWNTs) of graphene oxide (GO) and thin-walled carbon nanotubes (TWNTs) with different compositions were synthesized by a click chemistry reaction between alkyne-moiety GO and azide-moiety TWNTs. Polyurethane (PU) nanocomposites with the GO-click-TWNT hybrids were prepared to investigate an effect of the GO-click-TWNT hybrids on the mechanical properties of the PU nanocomposites. Synthesis of click coupled hybrids was confirmed by Fourier transform infrared, Raman, and X-ray photoelectron spectroscopies. The transmission electron microscopic measurements showed a well-networked structure between the GO and TWNTs in the hybrids. The GO and TWNTs in the hybrids had a synergistic effect on the mechanical properties of the PU nanocomposites. The PU nanocomposites with GO-click-TWNT hybrids with 3:7 GO/TWNT weight composition showed the highest breaking stress and modulus. The synergistic effect of the GO-click-TWNT hybrids was also shown in their electrical conductivity and near-infrared laser-induced photothermal properties.

Keywords: Carbon nanotubes, Graphene, Polymer nanocomposites, Mechanical properties.

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