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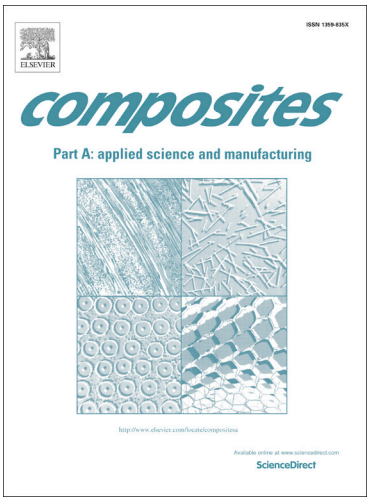

Bioinspired mechanical and thermal conductivity reinforcement of highly explosive-filled polymer composites

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PII: S1359-835X(17)30446-3
DOI: https://doi.org/10.1016/j.compositesa.2017.12.012
Reference: JCOMA 4861

To appear in: *Composites: Part A*

Received Date: 21 September 2017
Revised Date: 15 November 2017
Accepted Date: 12 December 2017

Please cite this article as: He, G., Liu, J., Gong, F., Lin, C., Yang, Z., Bioinspired mechanical and thermal conductivity reinforcement of highly explosive-filled polymer composites, *Composites: Part A* (2017), doi: https://doi.org/10.1016/j.compositesa.2017.12.012

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Bioinspired mechanical and thermal conductivity reinforcement of highly explosive-filled polymer composites

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ABSTRACT

The low mechanical and thermal conductivity property of polymer bonded explosives (PBX) could greatly restrict its further practical application. In this study, inspired by mussels, a facile and noncovalent modification for three carbon nanofillers including multiwalled carbon nanotubes (CNTs), graphene and graphene nanoplates (GNPs), was adopted by the self-polymerization of dopamine. Next, in-depth characterizations, including SEM, TEM, FTIR, FT-Raman and TGA, confirmed that the carbon nanofillers were successfully coated by a dense graphite-like structure polydopamine (PDA) without destroying the original structures, through the oxidation of dopamine at room temperature. The polydopamine-coated nanofillers (pFillers) were further incorporated into PBX matrix. Compared to neat PBX and PBX/carbon nanocomposites, the PBX/pFillers nanocomposites exhibited improved tensile and compression strength, creep resistance, and thermal conductivity. The work presented herein greatly broadens the application scope of the bioinspired dopamine, and will be potential of interest to the communities in highly particle-filled polymer composites.

Keywords: A. Polymer-matrix composites; A. carbon nanofillers; B. Creep; B. Thermal property

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