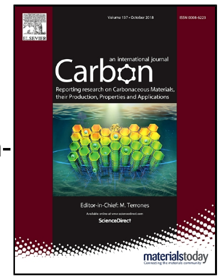
Accepted Manuscript



Improved thermal conductivity of carbon-based thermal interface materials by high-magnetic-field alignment

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PII:	S0008-6223(18)30762-0
DOI:	10.1016/j.carbon.2018.08.029
Reference:	CARBON 13384
To appear in:	*Carbon*
Received Date:	03 May 2018
Accepted Date:	12 August 2018

Please cite this article as: Seok-Hwan Chung, Hoyoung Kim, Sang Won Jeong, Improved thermal conductivity of carbon-based thermal interface materials by high-magnetic-field alignment, *Carbon* (2018), doi: 10.1016/j.carbon.2018.08.029

Improved thermal conductivity of carbon-based thermal interface materials by high-magnetic-field alignment

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Carbon-based fillers for thermal interface materials (TIMs) are attractive due to their advantages such as high thermal conductivity, low thermal expansion, mechanical strength, flexibility, and low weight. In this work, we report a 330 % enhancement of the through-plane thermal conductivity (k_{th}) of a graphite-polymer composite TIM film by vertically aligning the graphite fillers with a 10 T superconducting magnet. The filler alignment is based on the large anisotropy in the magnetic susceptibility of graphite platelets. As the filler content increases from 10 to 60 wt%, the anisotropy of thermal conductivity (k_{th}/k_{in}) increases from 1.2 up to 2.3 for a perpendicular magnetic field alignment, whereas it remains the same for a parallel magnetic field alignment. The increased anisotropy is associated with better filler alignment at high filler loadings. This work provides a simple and effective solution to improve the physical properties of composite films by controlling their microstructure.

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