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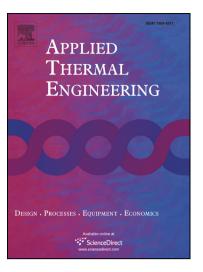
PII: S1359-4311(18)32952-1

DOI: https://doi.org/10.1016/j.applthermaleng.2018.06.049

Reference: ATE 12320

To appear in: Applied Thermal Engineering

Received Date: 12 May 2018 Revised Date: 8 June 2018 Accepted Date: 14 June 2018



Please cite this article as: L. Qiu, H. Zou, N. Zhu, Y. Feng, X. Zhang, X. Zhang, Iodine nanoparticle-enhancing electrical and thermal transport for carbon nanotube fibers, *Applied Thermal Engineering* (2018), doi: https://doi.org/10.1016/j.applthermaleng.2018.06.049

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## **ACCEPTED MANUSCRIPT**

# Iodine nanoparticle-enhancing electrical and thermal transport for carbon nanotube fibers

Lin Qiu<sup>a,b</sup>, Hanying Zou<sup>a,b</sup>, Ning Zhu<sup>a,b</sup>, Yanhui Feng<sup>a,b,\*</sup>, Xiaoliang Zhang<sup>c</sup>, Xinxin Zhang<sup>a,b</sup>

**ABSTRACT** The excellent electrical and thermal transport properties of individual carbon nanotubes (CNTs) have allowed them to stand out in nanoenergy and nanoelectronics applications. However, scaling them up from nanometer-sized tubes to micrometer assembled fibers generally leads to considerable electrical and thermal transport deterioration. In pursuit of a new strategy for boosting thermal and electrical transport, we experimentally confirmed that the intercalation of iodine (I) molecules can significantly raise the inter-tube interfacial electrical and thermal transport (IET and ITT), and thus boost the overall electrical and thermal transport performance of the fibers. The underlying mechanisms from an energy carrier standpoint are also explored and discussed. It is demonstrated that the introduced I molecules can invoke electron extraction from CNTs, which enhances the IET. The formed ( $I_3$ ) and ( $I_5$ ) polyiodide chains act as additional heat transfer channels and induce low-frequency phonons of the interfacial carbon atoms, and the intercalation also improves the matching level of the vibrational density of states at the inter-tube interface. These three-fold effects contribute to the ITT. Our findings are one step forward on the path towards advanced CNT-based functional materials with high electrical and thermal transport.

KEYWORDS: Carbon nanotube fiber · Electrical conductivity · Iodine nanoparticle-

<sup>&</sup>lt;sup>a</sup> School of Energy and Environmental Engineering, University of Science and Technology Beijing, Beijing 100083, China

<sup>&</sup>lt;sup>b</sup> Beijing Key Laboratory of Energy Saving and Emission Reduction for Metallurgical Industry, University of Science and Technology Beijing, Beijing 100083, China

<sup>&</sup>lt;sup>c</sup> Key Laboratory of Ocean Energy Utilization and Energy Conservation of Ministry of Education, School of Energy and Power Engineering, Dalian University of Technology, Dalian 116024, China

<sup>\*</sup>Corresponding author. Tel: 86-10-62332599. E-mail: yhfeng@me.ustb.edu.cn (Yanhui Feng)

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