Energy conversion behaviors of antimony telluride particle loaded partially carbonized nanofiber composite mat manufactured by electrohydrodynamic casting

Yong X. Gan, Ann D. Chen, Ryan N. Gan, Anan S. Hamdan

PII: S0167-9317(17)30307-6
DOI: doi: 10.1016/j.mee.2017.06.009
Reference: MEE 10617

To appear in: *Microelectronic Engineering*

Received date: 20 April 2017
Revised date: 12 June 2017
Accepted date: 30 June 2017

Please cite this article as: Yong X. Gan, Ann D. Chen, Ryan N. Gan, Anan S. Hamdan , Energy conversion behaviors of antimony telluride particle loaded partially carbonized nanofiber composite mat manufactured by electrohydrodynamic casting, *Microelectronic Engineering* (2017), doi: 10.1016/j.mee.2017.06.009

Energy Conversion Behaviors of Antimony Telluride Particle Loaded Partially Carbonized Nanofiber Composite Mat Manufactured by Electrohydrodynamic Casting

Yong X. Gan[a,*], Ann D. Chen[a], Ryan N. Gan[b], Anan S. Hamdan[c],

[a]Department of Mechanical Engineering, California State Polytechnic University Pomona, 3801 W Temple Avenue, Pomona, CA 91768, USA.

[b]Department of Statistics and Applied Probability, University of California Santa Barbara, Santa Barbara, CA 93106, USA.

[c]Department of Electromechanical Engineering Technology, California State Polytechnic University Pomona, 3801 W Temple Avenue, Pomona, CA 91768, USA.

Revised and Resubmitted to *Microelectronics Engineering*

June 12, 2017

---

*Corresponding author, Department of Mechanical Engineering, California State Polytechnic University, Pomona, 3801 W Temple Avenue, Pomona, CA 91768, Telephone: +1-909-869-2388, Fax: +1-909-869-4341, E-mail: yxgan@cpp.edu

Abstract

This work deals with the processing and energy conversion performance characterization of a partially carbonized nanofiber composite material containing antimony telluride (Sb_2Te_3) particles made by a new manufacturing technology of electrohydrodynamic casting. Dimethylformamide (DMF) dissolved polyacrylonitrile (PAN) polymer solution with a concentration of 10% was used as the precursor to generate the partially carbonized nanofibers. The antimony telluride particles were added into the polymer solution and electrohydrodynamically cast onto a soft tissue paper substrate to form a flexible composite fiber mat. The polymeric matrix composite mat was heat treated in hydrogen gas atmosphere to form partially carbonized nanofiber loaded with Sb-Te alloy fine particles. Scanning electron microscopy (SEM) analysis was performed to reveal the morphology and the composition of the composite material. Energy conversion behaviors in view of converting electromagnetic wave