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PII: S1359-835X(16)30278-0
DOI: http://dx.doi.org/10.1016/j.compositesa.2016.08.022
Reference: JCOMA 4398

To appear in: *Composites: Part A*

Received Date: 2 March 2016
Revised Date: 9 July 2016
Accepted Date: 19 August 2016

Please cite this article as: Yin, L., Zhou, X., Yu, J., Wang, H., Ran, C., Fabrication of a polymer composite with high thermal conductivity based on sintered silicon nitride foam, *Composites: Part A* (2016), doi: http://dx.doi.org/10.1016/j.compositesa.2016.08.022

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Abstract: A novel route was developed to fabricate Si_3N_4/epoxy composite. In this route, the Si_3N_4 particles were constructed into the foamed shape by using protein foaming method, firstly. Then the Si_3N_4 foams were sintered to bond these Si_3N_4 particles together. Finally, the Si_3N_4/epoxy composite was fabricated by infiltrating the epoxy resin solution into the sintered Si_3N_4 foams. This route was proved to be an efficient way in enhancing the thermal conductivity of epoxy matrix at a low loading fraction. For example, the thermal conductivity of the as-prepared Si_3N_4/epoxy composite with a loading fraction of 22.2vol% was up to 3.89 $W \cdot m^{-1} \cdot K^{-1}$, which was about 17 times higher than that of neat epoxy.

Keywords: A. Polymer-matrix composites (PMCs); A. 3-Dimensional reinforcement; B. Thermal properties; Silicon nitride foams.

1. Introduction

Heat dissipations made of polymer matrix composites (PMCs) with high thermal conductivity and excellent dielectric property are very important components in many high-density electronic devices, including central processing unites (CPUs), radio frequency (RF) unites, batteries and displays [1,2]. However, the intrinsic thermal conductivity of polymer is very low, for instance, the thermal conductivity of the widely used epoxy resin in these