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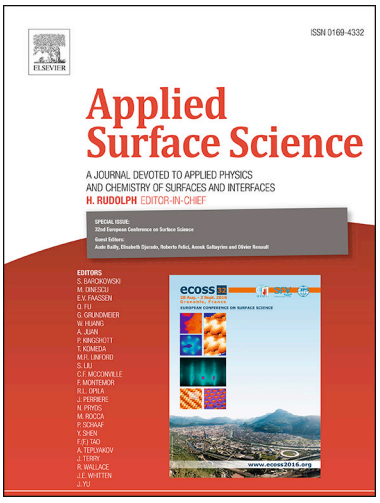

Full Length Article

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High-performance piezo-damping materials based on CNTs/ $BaTiO_3$/F-PAEK-b-PDMS under high temperature steam conditions

Xiang Yu[1], Yu Zhang[1], Lan Jin[1], Jingyu Chen[2], Zhenhua Jiang[1] and Yunhe Zhang[1]**

[1] *Key Laboratory of High Performance Plastics, Ministry of Education, College of Chemistry, Jilin University, Changchun, 130012, PR China.*

[2] *Institute for Frontier Materials, Deakin University, Geelong, Victoria 3216, Australia*

Abstract: Polymeric piezo-damping composites with robust piezo-damping performance under high temperature steam conditions are highly desirable. In this study, we demonstrate a novel piezo-damping material, consisting of fluorinated (polyaryletherketone)-(polydimethylsiloxane) block copolymers (F-PAEK-b-PDMS) as matrix, multi-walled carbon nanotubes (CNTs) as conductive filler, and barium titanate (BT) as piezoelectric phase. Taking the advantages of hydrophobic property of PDMS and good thermal stability of F-PAEK, piezo-damping materials exhibit good stability under high temperature steam conditions. Furthermore, for the incompatibility between F-PAEK and PDMS, microphase separation appears, which can greatly increase the friction between molecules for better damping capability. Good damping performances that loss factor > 0.3 over a broad temperature range of 55~115 ^{o}C ($\approx$60 ^{o}C) can be achieved. Those outstanding performances can effectively broaden the practical application of piezo-damping composites under harsh conditions.

Keyword: Poly aryl ether ketone; Block copolymer; Microphase separation; Composites; Piezo-damping;

1. Introduction

Vibration and noise, which can cause severe structural instability, equipment damage, chaotic or aeromechanical instability, are undesirable but omnipresent in our world. To alleviate such negative impact from vibration or noise, damping materials, helping convert the mechanical vibration energy to thermal or other kinds of energies, have gained special attention and widely applied in aerospace, automotive, marine, aircraft,