Accepted Manuscript

Review

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PII: S1359-835X(17)30260-9
DOI: http://dx.doi.org/10.1016/j.compositesa.2017.07.002
Reference: JCOMA 4722

To appear in: *Composites: Part A*

Received Date: 26 January 2017
Revised Date: 17 May 2017
Accepted Date: 1 July 2017

Please cite this article as: Tang, X., Yan, X., Acoustic energy absorption properties of fibrous materials: A review, *Composites: Part A* (2017), doi: http://dx.doi.org/10.1016/j.compositesa.2017.07.002

Acoustic Energy Absorption Properties of Fibrous Materials: A Review

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Abstract

Fibrous materials have been widely used in noise reduction due to the porous structures. In this review, available studies regarding the prediction methods of acoustic absorption coefficient are gathered. Empirical model could predict the acoustic absorption coefficient based on facile airflow resistivity, while microstructural model is determined by detailed structural parameters of fibrous materials. Various fibrous materials including inorganic and metallic fibers, synthetic fibers, natural fibers, and nanofibrous membranes for noise reduction are reviewed. Inorganic and metallic fibers have the advantages of corrosion resistance, high temperature resistance and long service life. The tailored cross-sections of synthetic fibers such as circle, hollow and triangle are beneficial to improve acoustic absorption properties. Natural fibrous materials are biodegradable, renewable and eco-friendly. Nanofibrous materials are lightweight and have good potential in low frequency noise reduction. Herein, we summarized the recent advances concerning the acoustic absorption of various fibrous materials.

Keywords

A. Fibres; A. Natural fibres; A. Fabrics/textiles; B. Physical properties

1 Introduction

Acoustic absorption materials could be classified as resonant absorber and porous absorber. Resonant absorber is the equivalent parallel connection of multiple Helmholtz resonator, where acoustic energy is consumed by the internal resonance effect [1-3]. Resonance absorption material can be usually divided into single resonator, perforated and micro-perforated panel, and membrane