Flexible silica aerogel composites strengthened with aramid fibers and their thermal behavior

Zhi Li, Lunlun Gong, Xudong Cheng, Song He, Congcong Li, Heping Zhang

PII: S0264-1275(16)30338-0
DOI: doi: 10.1016/j.matdes.2016.03.063
Reference: JMADE 1541

To appear in:

Received date: 28 December 2015
Revised date: 9 March 2016
Accepted date: 13 March 2016

Please cite this article as: Zhi Li, Lunlun Gong, Xudong Cheng, Song He, Congcong Li, Heping Zhang, Flexible silica aerogel composites strengthened with aramid fibers and their thermal behavior, (2016), doi: 10.1016/j.matdes.2016.03.063

Flexible Silica Aerogel Composites Strengthened with Aramid Fibers and Their Thermal Behavior

Zhi Li, Lunlun Gong, Xudong Cheng, Song He, Congcong Li, Heping Zhang*

State Key Laboratory of Fire Science, University of Science and Technology of China, Hefei, Anhui 230027, PR China

Abstract

To meet the flexibility of some practical applications, aramid fiber reinforced silica aerogel composites (AF/aerogels) were successfully prepared, which possessed low density, remarkable flexibility and excellent thermal insulation properties. The microstructure of the AF/aerogels showed that the aramid fibers were inlaid in the aerogel matrix acting as the supporting skeleton, which established the foundation of mechanical properties. Three point bending indicated that improvement in flexibility could be achieved by ~ 5% fiber content without compromising the thermal insulation properties. As the fiber content increased, the density monotonously decreased to 0.142 $g \cdot cm^{-3}$ while the thermal conductivity increased slightly with ranging between 0.0221 ~ 0.0235 $W \cdot m^{-1} \cdot K^{-1}$. The hot plate experiments indicated the transient thermal transfer was similar to one-dimensional heat transfer and the heat transfer characteristics were further analyzed in which a simple method to estimate the thermal conductivity was established according to the Fourier's law. TG-DSC analysis revealed that the thermal

* Corresponding author. Tel.: +86 0551 63606957.

E-mail address: zhanghp@ustc.edu.cn (H. Zhang).