

# Accepted Manuscript

Enhancing mechanical properties of clay aerogel composites: An overview

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PII: S1359-8368(16)30482-6

DOI: [10.1016/j.compositesb.2016.04.059](https://doi.org/10.1016/j.compositesb.2016.04.059)

Reference: JCOMB 4258

To appear in: *Composites Part B*

Received Date: 26 April 2016

Accepted Date: 27 April 2016

Please cite this article as: Madyan OA, Fan M, Feo L, Hui D, Enhancing mechanical properties of clay aerogel composites: An overview, *Composites Part B* (2016), doi: 10.1016/j.compositesb.2016.04.059.

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14 **Abstract**

15 While aerogel is a new classification of materials and considered most promising candidate for the  
16 advanced thermal insulation, clay aerogel shows significant potentials as it is natural, non-toxic,  
17 biodegradable and biocompatible material. To date most aerogels are produced through a supercritical  
18 drying process and most reviewed aerogels are silica based aerogels, nevertheless, more  
19 environmentally friendly aerogels have been attempted through the use of clays through an  
20 environmentally freeze-drying process. This paper presents a comprehensive overview of developing  
21 robust clay aerogels, including enhancing clay aerogel with various natural and synthetic polymers, and  
22 the reinforcement of clay-polymer aerogel with carbon nanotubes, natural fibres, glass fibre lamination  
23 and dip coatings. The results show that many factors could contribute to the classification of clay  
24 aerogels, including processing parameters and methodologies, raw materials as well as minor additives.  
25 One of the most significant setbacks regarding clay aerogels is their mechanical properties and in the  
26 past several years significant efforts have been spent on the improvement. The most successful method  
27 demonstrated so far was the incorporation of a water-soluble polymer and reinforcing aerogel  
28 composites with fibrous materials to achieve various levels of enhancements of clay-aerogels. This

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