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Cellulose aerogels from paper waste for oil spill cleaning and heat insulation of buildings

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The patent WO 2014/178797 of “A polysaccharide aerogel” granted on 6 November 2014 can help to solve environmental problems of Singapore and around the world tremendously by re-using paper waste. The cellulose aerogel was invented from recycled cellulose fibers of paper waste having larger diameters and lengths of 10-50 mm and 0.3-5 mm than those of nanoscale cellulose fibers of previous studies respectively. The developed cellulose aerogel was coated with at least one type of surface modifier like MTMS to make it oleophilic for oil absorbent but excluding water absorbent. The recycled cellulose aerogel was very cost-effective, flexible, squeezable, had a very low thermal conductivity like air and much larger pore sizes (micrometer range, 30-250 mm) than those synthesized from high purity cellulose fibers (nanometer range). The large size of the aerogel pores makes the aerogel to absorb liquids with high viscosity like crude oils up to four times more than current commercial sorbents. The cellulose aerogel having a surface modifier (silane groups) was stable at least six months in tropical weather. The recycled cellulose aerogel can be used as eco-friendly sorbents with high absorption for cleaning oil spills (potential market: \$143.5 billion in 2015), water repellent and eco-friendly heat insulators for buildings (potential market: \$3.3 billion dollar), piping and clothing.

Biography

Hai M Duong has attracted visibility to his research through Postdoctoral scholarships (MIT, USA; University of Cambridge, UK and University of Tokyo, Japan), awards, publications and invitations to international meetings. His core research interests are carbon nanotube (CNT) and aerogel materials and their applications. He has contributed 1 granted patent, 3 invited book chapters, more than 120 published peer-review papers and international conference proceedings. He has been an Editorial Member of International Journal of Aeronautical Science & Aerospace Research (IJASAR), a Key Member of Functional Materials Society in Singapore, a Member of 4 international conference committees and the Reviewer of 37 preferred journals.

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