

ADVANCED FABRICATION AND MULTI-PROPERTIES OF RUBBER AEROGELS FROM CAR TIRE WASTE

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Abstract

According to the European Waste Codes EWC 19.12.08, waste tire fibers are known as special wastes that must be burned or buried. However, these activities would pose additional risks including soil pollution, and groundwater contamination. Scientists are continually discovering more new ways to recycle these wastes in order to minimize its ecological consequences. Our effort has been also directed into this direction, and we have been able to convert rubber fibers from tire waste into aerogels, an ideal candidate for a wide range of advanced applications due to their low density, high porosity, low thermal conductivity and high sound absorption coefficient. A novel but simple and time-saving strategy to fabricate rubber aerogel from waste tire fibers, derived from car tire wastes, is reported using a freeze-

drying process. The obtained rubber aerogel with a robust mechanical performance, exhibiting a Young's modulus up to 965.6 kPa and density 91 mg cm⁻³, can withstand a large elastic deformation without fracture. In addition, with a highly porous structure (porosity > 90%) and an ultralight light density (20-91 mg cm⁻³), our rubber aerogels have a high sound absorption efficiency (noise reduction coefficient, or NRC of 0.56), and an excellent thermal conductivity (0.035 - 0.049 W m⁻¹ K⁻¹). These advanced rubber aerogels can be a promising candidate for thermal and acoustic insulation in cabins, vehicles, buildings, and aerospace.