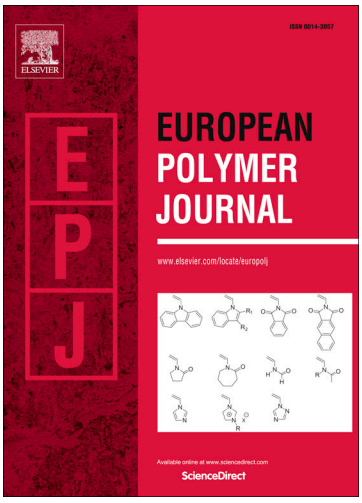

Macromolecular Nanotechnology

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Evaluation of lightweight and flexible insulating aerogel blankets based on Resorcinol-Formaldehyde-Silica for space applications

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Abstract

New hybrid organic-inorganic benzoxazine aerogel blankets for space applications have been synthesized and studied. Aerogel blankets were produced using a one-pot synthesis method with a PET unwoven fibrous network core, resorcinol, formaldehyde and a silica source (APTES with MTES or MTMS as silica co-precursors). Modifying the composition of the sol significantly impacts the physical characteristics of the resulting material such as texture (density and porosity), hydrophilicity and thermal conductivity. The apparent density of the materials decreases when the percentage of solid in the sol ($\%_{solid}$) decreases and the molar ratio n_{MTES}/n_{APTES} increases. Within the density range studied, apparent density and effective thermal conductivities are inversely proportional. By replacing a part of APTES by MTES or MTMS the density of the aerogels decreases notably whilst maintaining the level of thermal conductivity. This replacement is detrimental to water adsorption which increases for most conditions studied. When MTMS is used as silica co-precursor instead of MTES no significant differences in water adsorption and thermal