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M1Po3D-01: Cryogenic properties of polyimide aerogel composites for thermal insulation

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Polyimide (PI) aerogels have the advantages of low density, low thermal conductivity, excellent thermal stability and a wider range of working temperature than other organic aerogels, making them promising materials for cryogenic thermal insulation. The use of aerogel materials to replace the traditional porous perlite materials can further reduce the insulation cost, weight and space. Up to now, there has already been researches on polyurethane foams as well as commercial aerogel blankets as substitute insulation material. However, the cryogenic characteristics of those materials such as mechanical properties, thermal insulating performance are normally the main limitations to their applications. In this work, attracted by the unique advantages of PI aerogels, we managed to validate their thermal insulation capabilities under cryogenic conditions (77K). A series of PI aerogel composites were prepared and characterized for the microstructure and cryogenic properties. This work provides a theoretical basis for the thermal insulation application of PI aerogel composites under cryogenic conditions.

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