Investigation on the thermal properties of carbon fibres with silica-based aerogel composites

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**Abstract**. In this research, thermal protection systems of space hardware have prompted the development and study of silica aerogel composites bonded with a variety of carbon fibres. Carbon fibres were woven into a matrix of tetra ethoxy silane (Ts) and vinyl tri-methoxy silane (Vs) to create these composites. Many different composites were developed, each with its own set of characteristics and capabilities because to the wide range of fibres used. The measured bulk density values were often relatively low, with the lowest recorded value being only 180 kg/m3. The thermal conductivity was reduced to below 30 mW/mK and the stability was maintained up to 600°C. Nanocomposites consisting of longer fibres containing meta-carbons are superior insulators, while short-fiber composites are stiffer and have lower thermal conductivities. The aerogel composites' compliance with space conditions was evaluated using standard space materials qualification procedures like thermal cycling and outgassing, proving their fitness for use in this context.

References:

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