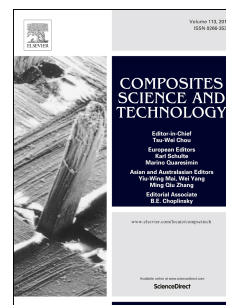


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Novel carbon-poly(silacetylene) composites as advanced thermal protection material in aerospace applications

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Abstract: In the present work, a new class of 2.5D woven carbon-poly(silacetylene) composites derived from three novel poly(silacetylene) resins has been developed by VARTM process and evaluated to determine the potential for serving as advanced thermal protection material. TG analysis, PGC-MS analysis, Ar arc plasma ablation test, microstructural analysis and a ATCM have been employed to investigate the effects of chemical structures and thermal stability of poly(silacetylene) matrices on the ablation performance of their carbon fiber composites. The incorporation of rigid phenyl groups into poly(silacetylene) matrices can significantly improve the ablation-resistant performance of their carbon fiber composites, which may be ascribed to decreased pyrolysis gaseous volatiles and decreased pyrolysis residue of SiC for the poly(silacetylene) matrices during ablation, resulting in a remarkable enhancement in the mechanical spallation resistance. All the developed carbon- poly(silacetylene) composites exhibit excellent ablation-resistant performance with a recession rate ranging from $0.31 \text{ mm}\cdot\text{s}^{-1}$ to $0.40 \text{ mm}\cdot\text{s}^{-1}$, which would make them good candidates for advanced thermal protection materials in aerospace applications.

1. Introduction

Advanced composites are an important class of engineering materials due to their outstanding

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