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研究论文

耐超高温连续SiC纤维制备过程中纤维结构和取向演变

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摘要 以聚铝碳硅烷(PACS)为先驱体, 采用先驱体转化技术制备出耐超高温的连续SiC纤维. 研究了制备过程中纤维结构和取向的演变及其对纤维性能的影响. 研究结果表明, 耐超高温连续SiC纤维制备过程中纤维结构的演变随温度变化分为分子间交联(≤600 ℃)、基本无机化(600—800 ℃)、完全无机化(800—1300 ℃)和结晶重排(1300—1800 ℃) 四个阶段; 纤维的取向随着结构的演变而改变, 连续PACS纤维沿轴向具有的微弱取向, 经热分解后演变到1300 ℃的产物中, 1300 ℃后随着结晶重排的发生, 纤维由各向异性转变为各向同性; 结构和取向的转变对于纤维性能具有很大的影响.

关键词 耐超高温连续SiC纤维 取向 先驱体转化法 聚铝碳硅烷

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Evolutions of Structure and Tropism of Fibers During Preparation of Polymer-derived High-temperature Resistant Continuous SiC Fibers

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Abstract High-temperature resistant continuous SiC fibers were prepared by polymer-derived method using precursor polyaluminocarbosilane(PACS). The evolutions of the fibers structure and tropism during the preparation and its effect on the properties of the fibers were investigated. The results show that the evolutions of structure of continuous cured PACS fibers included four stages: crosslinking among the molecules of the fibers(≤600 ℃), basically inorganic transformation(600—800 ℃), completely inorganic transformation(800—1300 ℃), crystallization and redistribution of the structure(1300—1800 ℃). The tropism of the fibers changed with the evolutions of the structure. Continuous PACS fibers had the weak tropism along the fiber axis and it was evolved to the products prepared at 1300 ℃. The fibers transformed from anisotropic to isotropic state at 1500 ℃. The properties of continuous SiC fibers were affected greatly by the evolutions of the structure and tropism.

Key words High-temperature resistant continuous SiC fibers Tropism Polymer-derived method Polyaluminocarbosilane

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