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化学气相渗透制备氧化硅基复合材料

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FABRICATION OF SILICA MATRIX COMPOSITE BY CHEMICAL VAPOR INFILTRATION

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摘要

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摘要 以正硅酸乙酯为氧化硅先驱体,以 Nextel4 80纤维三维编织体作为沉积载体,采用化学气相渗透的方法制备了 Nextel4 80 /氧化硅复合材料。研究了正硅酸乙酯温度和沉积温度对沉积速率和渗透效果的影响,分析了沉积过程中产生瓶颈效应和固相粉末的原因以及沉积产物的相和复合材料的显微结构。结果表明 :1沉积速率随正硅酸乙酯温度和沉积温度的升高而显著升高;2瓶颈效应是由于正硅酸乙酯浓度过高,导致沉积速率过快引起的;3固相粉末是因为沉积温度过高,正硅酸乙酯分子或分解的过渡产物在到达沉积区域前已经完全分解引起的;4正硅酸乙酯为先驱体的化学气相沉积产物为无定型氧化硅;5化学气相沉积获得的无定型氧化硅基体与纤维有较佳的热匹配

关键词: 正硅酸乙酯 化学气相渗透 氧化硅 复合材料

Abstract: Nextel 480/silica composite was fabricated by chemical vapor infiltration. Tetraethylorthosilicate was used as precursor. The influence of the tetraethylorthosilicate temperature and deposition temperature on deposition rate and infiltration effect was investigated. The reason of the creation of the bottleneck effect and solid powder was analyzed. The phase of deposition production and the microstructure of the composite were characterized. The results indicated: (1)The deposition rate increases markedly with the tetraethylorthosilicate temperature and deposition temperature increasing; (2)The bottleneck effect results from the higher tetraethylorthosilicate concentration; (3)The solid powder results from the higher deposition temperature; (4)The production deposited from Tetraethylorthosilicate is amorphous silica; (5)The silica deposited has the good thermal match with Nextel 480 fiber and no crack was found on the surface of silica matrix.

Keywords: tetraethylorthosilicate chemical vapor infiltration silica composite

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