

研究论文

反应烧结多孔碳化硅的高温氧化行为

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摘要:

研究了反应烧结多孔碳化硅(RPSC)陶瓷在1200--1500℃干燥氧气中的氧化行为。结果表明,与碳化硅致密块的高温氧化行为不同,温度越高,RPSC的氧化增重越小;RPSC的整个氧化过程分为氧化初期的快速增重阶段和缓慢氧化的平台阶段,氧化动力学曲线符合渐近线规律。RPSC的高温氧化在外表面和孔隙内同时发生,孔隙内的氧化占主导地位,最大氧化增重与孔隙率成线性关系。当孔内氧化速率高于氧气向孔内的传输速率时,氧化主要发生在孔口附近,氧化硅很快将孔封闭,阻止了孔内继续氧化。

关键词: 无机非金属材料 热氧化 反应烧结多孔碳化硅 孔隙率 动力学

The High Temperature Oxidation Behavior of Reaction-bonded Porous Silicon Carbide Ceramics

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Abstract:

The oxidation behavior of reaction-bonded porous silicon carbide (RPSC) ceramics with different open porosities was studied in dry oxygen between 1200 and 1500°C. RPSC ceramics exhibited a rapid mass increase in the initial stage of oxidation and a slow mass increase in the following oxidation. This oxidation behavior of RPSC is more plausible to be represented by an asymptotic law rather than the parabolic law for dense SiC. The porosity of RPSC led to dominant internal oxidation mass gain in pore channels at the beginning of oxidation besides surface oxidation. The oxidation mass gain was proportional to the amount of the porosity. As the oxide growth rate near the pore mouth was much faster than the rate of oxygen supply to the interior of the pores, the pores were blocked by silica rapidly, which subsequently prevented the further oxidation of the inner pores.

Keywords: inorganic non-metallic materials thermal oxidation reaction-bonded porous SiC porosity kinetics

收稿日期 2009-09-07 修回日期 2009-11-05 网络版发布日期 2010-02-04

DOI:

基金项目:

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