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Silicon carbide-based foams derived from foamed SiC-filled phenolic resin by reactive infiltration of silicon

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Abstract: Macro-cellular porous silicon carbide-based foams were fabricated by reactive infiltration of melt silicon into porous carbonaceous preforms pyrolyzed from foamed SiC-filled phenolic resins (PF). The SiC-filled PF foams were prepared at 80 °C with different heating rate. The effect of heating rate on the foaming behavior of the liquid SiC-filled PF mixture and the microstructure of the foams were investigated. The foamed SiC-filled PF was then pyrolyzed at 1000 °C and infiltrated by melt Si at 1600 °C, leading to the formation of open macro-cellular structure. At a heating rate of 6 °C·min⁻¹, Si-infiltrated foams with a porosity of ~72% and a mean pore size of ~0.5 mm were obtained. The Si-infiltrated foams with dense struts mainly inherited the pore structure of pyrolyzed preforms. The main phases of SiC-based foams were α -SiC, β -SiC and the remnant Si, which contributed to high compressive strength of the SiC-based foams.

Keywords: D. SiC; Phenolic resin; Foaming; Reactive infiltration; B. Porosity.

1. Introduction

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