SILICON CARBIDE CHEMICAL VAPOUR INFILTRATION

Y. Roman, L. Wolff

JOURNAL DE PHYSIQUE
Colloque C5, supplément au n°5, Tome 50, mai 1989

SILICON CARBIDE CHEMICAL VAPOUR INFILTRATION

Y.G. ROMAN and L.R. WOLFF

Centre for Technical Ceramics, PO Box 513, NL-5600 MB Eindhoven, The Netherlands

The kinetics of a SiC chemical vapour deposition and infiltration process were studied. SiH_4 and C_2H_4 were used as precursors:

$$SiH_4\ (g) + 1/2C_2H_4(g) \rightarrow SiC(s) + 3H_2(g)$$

The composition and microstructure of the resulting coatings were investigated. Furthermore the deposition rate on the surface as well as in pores of the substrate were studied.

To this end, graphite substrates were used that were provided with model pores: cylindrical holes 200-1000 m in diameter. The thickness profile of the SiC coating on the pore wall was measured using Scanning Electron Microscopy. The dependency of this profile on the various process parameters like: temperature, total pressure, gas composition and flow rate was studied. The results obtained in the present investigation were compared to those obtained by other investigators (Fitzer, van den Brekel, Rossignol) and their respective chemical vapour infiltration models.

Apart from this fundamental approach to the CVI process, a CVI apparatus is being developed for manufacturing ceramic/ceramic composites. Fibrous preforms of either graphite or silicon carbide will be densified in this apparatus by CVI. The main goal of the present project is to produce dense ceramic composites in this apparatus using CVI in a combined temperature and pressure gradient accross the fibrous preform.

The resulting C/SiC and SiC/SiC composites will be characterized in terms of their microstructure and porousity, with special attention being given to the fibre-matrix interface. Furthermore high temperature mechanical and corrosion properties will be determined in various atmospheres.