

Effects of time parameters in manufacturing C/SiC composites in a pulse-CVI batch reactor

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Manufacturing C/SiC composites from the reaction of methyltrichlorosilane (CH_3SiCl_3 MTS) and hydrogen using a pulsed chemical vapor infiltration (Pulse-CVI) in a batch reactor has been studied. Preform used in this study was three-dimensional carbon fiber preform. Experimental parameters were the reactant gas concentration, the gas admission time(t_a), the evacuation time(t_p) and the number of pulse. In the pulse CVI process, sequential steps of evacuating by-product gas from the pores, instantaneous introduction of reactant gases into the pores and holding the gas for reaction are repeated. By doing so, the reactant gases diffuse far into the preform. Accordingly, this process can have a short operation time with sufficient infiltration into the pores.

As the short admission time (t_a) prevents from plugging pores, it becomes possible to infiltrate into the preform and fill pores uniformly. The longer the evacuation time (t_p) becomes, the more uniformly the deposition in the preform was obtained. The infiltrated amount was measured by comparing the masses before and after the infiltration and with the analysis of TGA. The shape of deposit was tested with a porosimeter and SEM.