

MaMaSELF

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New coating process for SiC-Fibers and its effects on mechanical properties of SiC/SiC composites

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Fiber-reinforced ceramic matrix composites (CMCs) have the potential of operating at temperatures greater than 1100°C with minimal or no cooling, which will produce a variety of performance advantages. Achieving a CMC system with the required thermal and structural properties will depend on the ability to design and process the CMC so that it achieves the proper microstructure features. The three major constituents of any continuous fiber ceramic matrix composite are the reinforcing fibers, the matrix and a fiber-matrix interphase, usually included as a coating on the fibers. As with most other ceramic composite systems, a coating is applied to the fibers to serve as the fiber-matrix interface. Such a fiber coating is necessary to prevent chemical attack of the fibers during processing and to provide for a weak mechanical interface between the fiber and matrix for enhanced toughness and graceful failure. The state of the art coating is today most widely applied by chemical vapour deposition (CVD).

The aim of the present Master Thesis is to develop a simple method to coat ceramic fibers with BN. In recent years, some researchers had successfully used dip-coating method to prepare coatings on fibers. The dip-coating method, comparing with the CVD method, was simpler in operation, inexpensive and might obtain uniform coatings on both surface and interior fibers of 2.5D fabric, which had been widely used in ceramic matrix composites.

In this study, low-cost and harmless raw materials are employed to prepare coatings on carbon and silicon carbon fibers by dip-coating method with special attention directed towards coating thickness control. Thus, the dip-coated BN coatings could serve as low cost and anti-oxidation interphase for SiC/SiC composites.

In the first step continuous dip-coating equipment will be used to coat C-fibers initially and SiC fibers afterwards. The BN coating will be investigated by XRD, SEM, FT-IR, XPS and Raman spectroscopy. The influence of BN coatings on mechanical properties of SiC/SiC composites will also be studied by manufacturing SiC/SiC composites by Liquid Silicon Infiltration (LSI) route.

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