

Plasma etching of SiC/SiC composites to improve joint strength

Alessandro De Zanet^{a*}, Matteo Pedroni^b, Valentina Casalegno^a, Milena Salvo^a, Espedito Vassallo^b

^a *Department of Applied Science and Technology, Politecnico di Torino, Turin, 10129, Italy*

^b *Institute for Plasma Science and Technology, National Research Council of Italy, Milan, 20125, Italy*

*corresponding author: alessandro.dezanet@polito.it

Ceramic matrix composites (CMCs) offer unique properties to address harsh environments because of their high-temperature mechanical behavior and chemical resistance. To manufacture the final component, parts made of CMCs usually have to be integrated with other materials or with themselves by joining.

A sound joint is vital for providing a solution for the targeted application. To this end, surface preparation is a key step to enable the formation of a strong interface between the joining material and the part to be joined. In particular, a texturized surface can provide mechanical anchoring points between the adhesive and the underlying material, resulting in higher mechanical resistance of the joint[1]. Among the viable textures, a brush-like one is of particular interest to improve the interlocking effect in joining CMCs[2].

In this work, 2D SiC/SiC composites were etched via a fluorine-based plasma process to provide a brush-like texturized surface as a result of the differential etching experienced by the matrix and the fibers. A similar treatment was successfully proposed for surface modification of bulk SiC in previous work[3].

Then, several plasma conditions were tested, and one was selected as suitable. Finally, the plasma-etched SiC/SiC and the untreated SiC/SiC were joined using a brazing alloy and they were mechanical tested to assess the effectiveness of the treatment in enhancing the joint strength.

The results of the activity are presented.

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- [3] V. Casalegno, M. Ferraris, S. Perero, M. Suess, C. Wilhelmi, M. Pedroni, E. Vassallo, M. Salvo, A plasma pre-treatment to improve adhesion on SiC and Si₃N₄ ceramics, *Mater. Lett.* 272 (2020) 127855.