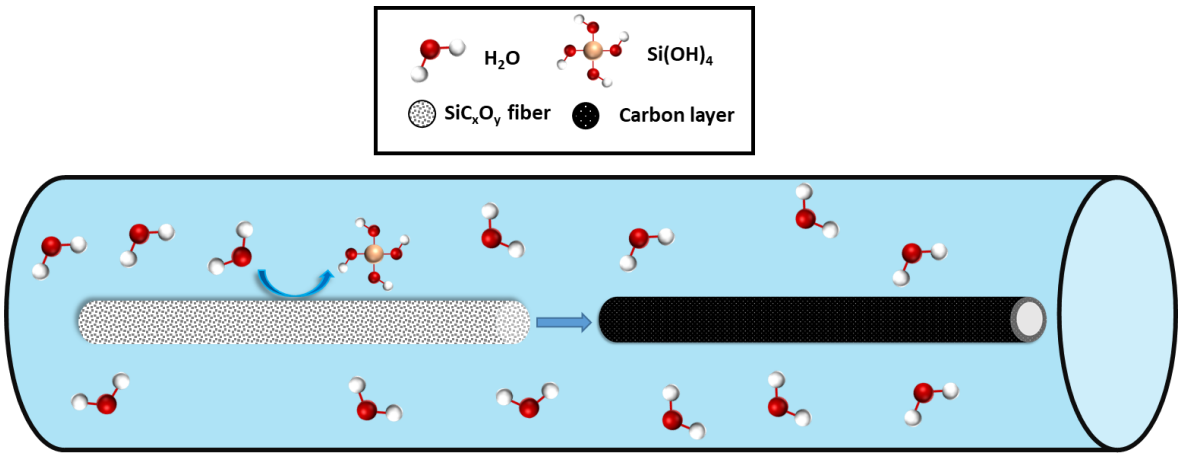
Surface modification of ceramic fibers using a hydrothermal treatment

N. Biscay,[a] L. Henry,[a] C. Huguet,[b] S. Loison [b] and C. Aymonier [a]

a CNRS, Univ. Bordeaux, Bordeaux INP, ICMCB, UMR 5026, 33600 Pessac, France
b Safran Ceramics, Les cinq chemins – rue de Touban, 33185 Le Haillan, France

Ceramic matrix composites are promising materials in aerospace applications, especially to replace Ni-based superalloys in the hot zone of turboreactors. Ceramic matrix composites consist in ceramic fibers embedded in a ceramic matrix. To enable a pseudo-ductile behavior for the material, a thin layer, called interphase, is deposited on the fibers prior densification, and acts as a mechanical fuse. The interphase is generally composed of pyrocarbon or boron nitride.[1]
To improve adhesion between the interphase and the fibers, a layer of carbon can be grown on the fibers, with a surface treatment comprising an oxidation in air and the use of strong acids.[2]
This work demonstrates the possibility of substituting this conventional process using strong acids by a water-based treatment, thanks to the tunability of water properties under hydrothermal conditions. Using this treatment, similar fibers to the acid treated ones were obtained, in terms of chemical composition and homogeneity.[3]
More precisely, water can interact with oxycarbidic phases present in the fibers[4], and extracts silicon from the fiber surface, leaving a C-rich layer on it.[5,6] This process therefore replaces the commonly used treatment by a single step process that is ecologically friendly since only water is used.



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