

SANDWICH STRUCTURED SILICON CARBIDE CERAMICS

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Summary. *Sandwich structured composites represent a lightweight structural solution widely employed in industrial, aeronautical, automotive and naval applications. There are also high temperature sandwich applications where metals or ceramics are applied. Some of them employ ceramic foams as sandwich cores and only few, silicon carbide foams [1][2]. SiC foams can withstand long oxidative exposing conditions with low material degradation[3]. For thermo-structural applications, in harsh environments sandwich skins should be made of ceramic matrix composites (CMC) because of their strength and resistance to high temperatures (Figure 1).*

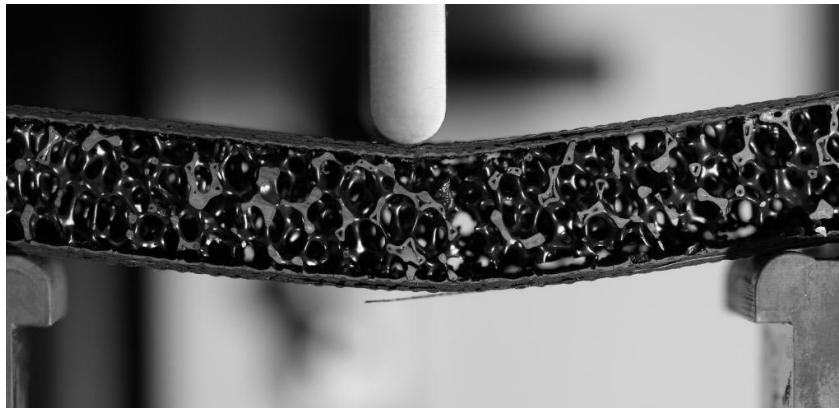


Figure 1 Sandwich structured SiC composite under bending

A new manufacturing method of sandwich structured SiC ceramics is here presented[2]: it is performed during their manufacturing in an integrated fashion and allows the production of complex shapes at low costs. Faces to core bonding is performed with a preceramic polymer based slurry which effectively joins foams struts to perform fiber bundles.

Figure 2 shows that under bending these ceramic structures, present a peak stress (corresponding to a crack into the foam), and do not experience a catastrophic failure (as per the plain foams), showing indeed a marked toughening behavior due by the foam peculiar failure mode.

Since Si-SiC material posses a high value on electrical conductivity, first crack into the ceramic core can be detected by a huge electrical resistance increase, allowing a sort of health monitoring during sandwich service. Further analysis on the mechanical behavior of this category of sandwiches, reveals that failure mode is mainly dominated by shear stresses because of the large difference between foams and skins Elastic Modula. This structures bending behavior can thus be optimized by choosing an appropriate CMC and foam.

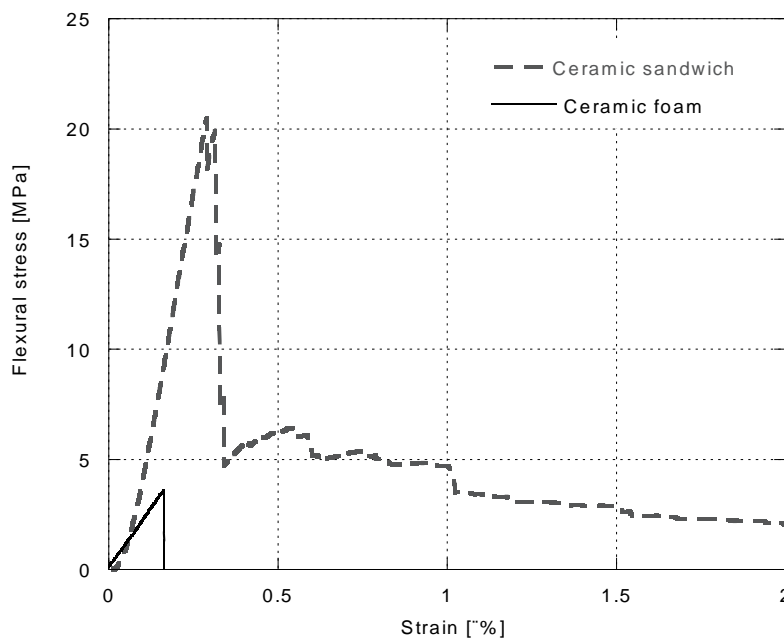


Figure 2 Bending curves of plain foams (solid line) and sandwich structured SiC ceramics (dashed)

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