MICRO-MECHANICAL TESTING BY FIBRE PUSHOUT OF THE BN INTERLAYER IN SIC_F/SIC COMPOSITES FOR AERO-PROPULSION

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Ceramic Matrix Composites (CMC's) are finding renewed interest in the aerospace community for use as high temperature components in engines due to the potential for cooling air reductions over metallic parts, amongst other benefits such as weight saving and improving the turbine blade clearance. Quasi-brittle SiCf/SiC composites are toughened by the application of a boron nitride interphase coating to the fibre, which allows for cracks to deviate from the matrix. The principal issues faced by SiC-based composites lie in their degradation in corrosive environments (changing the interphase region and embrittling the overall composite) and their current inadequacy to adopt performance life models. Therefore, maintaining the interfacial properties of the composite at high temperatures is crucial. The extraction of these said properties has however proven itself to be a major engineering challenge in materials science. A few meso-scale and macro-scale techniques such as the transverse bend test and the Brazilian disc compression test have shown experimental reproducibility but are unsupported by sufficient modelling. The most accurate method for determining the properties at the micro-scale remains the push-out method on singular fibres. Herein the talk will present current both advances in using the fibre push-out method and some of the challenges to overcome with push-outs in order to accurately measure the interfacial shear stresses, coefficients of friction and residual compressive stresses at the fibre/matrix interface. The push-out method will be contrasted to the fibre push-back and push-in techniques and a novel 'via' push-out method will be introduced. Finally, suggestions for improving the method to corroborate with ongoing modelling work will be showcased.