

INFORMATICS BASED STRUCTURE-PROPERTY LINKAGES FOR TRANSVERSE STRENGTH OF CERAMIC MATRIX COMPOSITES

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Advances in informatics and machine learning have revolutionized entire economic segments including advertising, pharmaceuticals, and finance. Recently efforts have sought to apply these approaches in materials science to better understand processing-structure-property relationships for materials development, concurrent material and component design and accurate performance prognosis of material behavior in application environments. Here informatics approaches are employed to understand the influence of topology of BN coated continuous SiC fibers embedded in a SiC matrix or SiC/SiC ceramic matrix composites on transverse cracking strength.

Multiple statistical volume elements were instantiated and simulated via Regularized eXtended Finite Element Approach (RxFEM) that models discrete damage propagation without a-priori definition of damage location or path. Influence of local fiber spacing and fiber clustering are considered. Novel statistical approaches based on two point correlation functions were employed to identify relationships between the statistical distribution of the fibers and fiber strength.

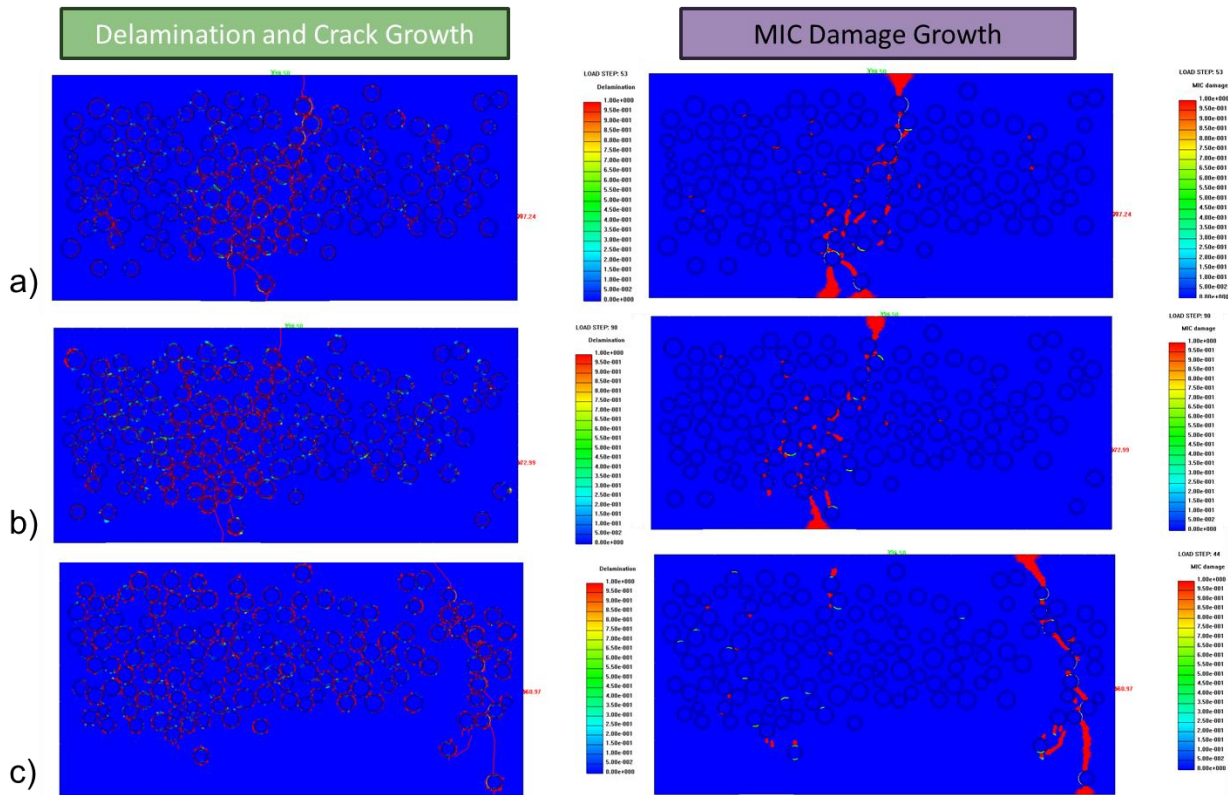


Figure 1 – Example of distributed damage at the scale of the fibers for three different microstructures a), b) and c), respectively