ON THE GROWTH OF FATIGUE CRACKS IN ADVANCED CERAMICS AND INTERMETALLICS

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The mechanisms of fatigue-crack propagation are examined with particular emphasis on the similarities and differences between cyclic crack growth in ductile materials, such as metals, and corresponding subcritical cracking in brittle materials, such as monolithic and composite intermetallics and ceramics. This is achieved by considering the process of fatigue-crack growth as a mutual competition between intrinsic mechanisms of crack advance ahead of the crack tip (e.g., alternating crack tip blunting and resharpening), which promote crack growth, and extrinsic mechanisms of crack-tip shielding behind the tip (e.g., crack closure and bridging), which impede it. The widely differing nature of these mechanisms in ductile and brittle materials and their specific dependence upon the alternating and maximum driving forces (e.g., ΔK and K_{max}) provide a useful distinction of the process of fatigue-crack propagation in the different classes of materials; moreover, it provides a rationalization for the effect of such factors as the load ratio and variable-ampltude loading.