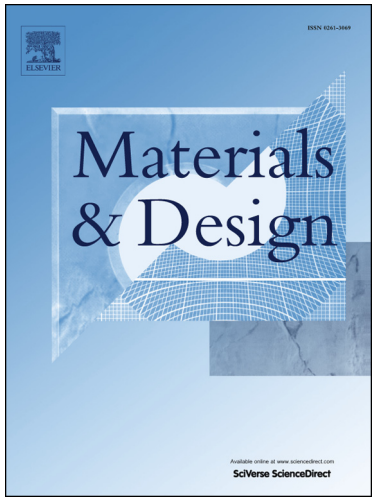

A strain-dependent ductile damage model and its application in the derivation of fracture toughness by micro-indentation

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A strain-dependent ductile damage model and its application in the derivation of fracture toughness by micro-indentation

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Abstract: In order to integrate different types of ductile damage characteristics (damage variable *D*, void volume fraction *f* and Young's modulus *E*), a strain-dependent ductile damage model based on the continuum damage mechanics (CDM) was established. Subsequently, the damage model was used to derive fracture toughness by micro-indentation through the sequent calculations of critical indentation depth and critical surface energy per unit area. Experimental researches of inspecting the newborn model and fracture toughness derivation by micro-indentation were conducted by repeated loading-unloading tests of stainless steel (SS 302) and micro-indentation test of Ti-6Al-4V α phases. The repeated loading-unloading results confirmed the accuracy of the strain-dependent ductile damage model, and the fracture toughness from micro-indentation test agreed well with theoretical calculation within an approximately relative difference of 7.4%.

Keywords: Ductile damage model , constitutive equation, micro-indentation test, fracture toughness