

Free epub Introduction to thermodynamics of mechanical fatigue

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In materials science fatigue is the initiation and propagation of cracks in a material due to cyclic loading once a fatigue crack has initiated it grows a small amount with each loading cycle typically producing striations on some parts of the fracture surface [1] this mechanical degradation is evaluated with durability tests based on fatigue crack propagation where the crack growth rate of a precracked specimen is monitored over a range of cyclic deformations or energy release rates [2] what is material fatigue material fatigue is a phenomenon where structures fail when subjected to a cyclic load this type of structural damage occurs even when the experienced stress range is far below the static material strength fatigue is the most common source behind failures of mechanical structures [3] materials can suffer mechanical fatigue when subjected to cyclic loading at stress levels much lower than the ultimate tensile strength and understanding this behaviour is critical to evaluating [4] according to the source of stress fatigue can be classified into mechanical fatigue and thermal fatigue for engine components the effects are usually combined as thermo mechanical fatigue according to the number of cycles to failure [5] there are three commonly recognized forms of fatigue high cycle fatigue hcf low cycle fatigue lcf and thermal mechanical fatigue tmf the principal distinction between hcf and lcf is the region of the stress strain curve where the failure occurs [6] fatigue failure in polymeric materials can occur by either of two processes [7] i thermal fatigue where failures occur by thermal softening and melting due to massive hysteretic heating or ii by mechanical fatigue where [8] these are the proceedings of the xix international colloquium on mechanical fatigue of metals university of porto portugal september 2018 covering basic and applied research on the fatigue of metals looking at the problem of fatigue exploring analytical and numerical simulative approaches [9] in fact fatigue failure affects almost all metals and 90 of mechanical service failures can be attributed to fatigue [10] therefore it is essential to conduct systematic investigations into fatigue behavior and understand its intrinsic

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