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Three-dimensional fatigue fracture mechanics：Bridge the gap from laboratory to engineering Structures

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Abstract

This talk reviews advances in three-dimensional (3D) fatigue fracture mechanics, bridging laboratory research and engineering applications. It highlights limitations of traditional fatigue life and damage tolerance design methods and presents the development of 3D constraint theories. Key progress includes extensions from 2D to 3D analysis, tensile to mixed-mode loading, static to fatigue/creep fracture, and ambient to high-temperature conditions. These contributions provide a theoretical foundation for predicting fatigue life and ensuring structural durability and reliability.

Keywords
Three-dimensional Fatigue Fracture; Damage Tolerance; Constraint Theory; Crack Growth; Durability Design