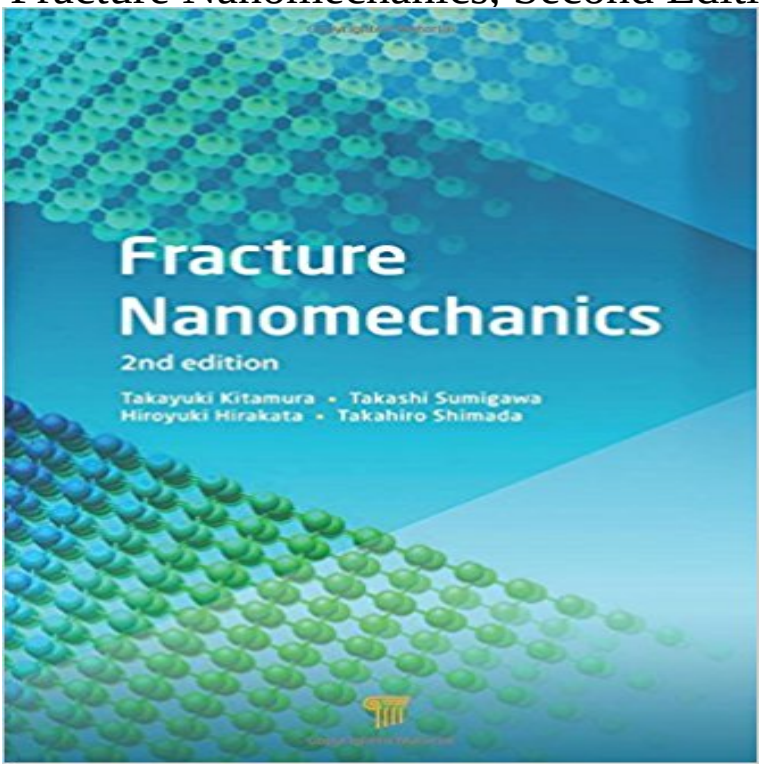
Fracture Nanomechanics, Second Edition



Materials of micro-/nanometer dimensions have aroused remarkable interest, motivated by the diverse utility of unconventional mechanical and electronic properties distinguished from the bulk counterpart and various industrial applications such as electronic/optic devices and MEMS/NEMS. The size of their elements is now, ultimately, approaching nanometer and atomic scales. Since the conventional theory of fracture mechanics is based on the continuum-body approximation, its applicability to the nanoscale components is questionable owing to the discreteness of atoms. Moreover, for describing the fracture behavior of atomic components, it is necessary to understand not only the mechanical parameters (e.g., stress and strain) but also the fracture criterion in the atomic scale. This book systematically provides recent understanding of unusual fracture behaviors in nano/atomic elements (nanofilms, nanowires, etc.) and focuses on the critical initiation and propagation of interface crack and the mechanical instability criteria of atomic structures through the introduction of state-of-the-art experimental and theoretical techniques. It covers the fundamentals and the applicability of top-down (conventional fracture mechanics to nanoscale) and bottom-up (atomistic mechanics, including quantum mechanical effects) concepts. This second edition of Fracture Nanomechanics newly includes dramatic advances in unconventional fracture mechanics in nanofilms, extraordinary fatigue mechanics and mechanisms in nanometals, and a new area of multiphysics properties in nanoelements.

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