# On the Micromechanical Characterization of Metallic MEMS by a Hybrid Microtester

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ABSTRACT

## abstract

Mechanical testing of microelectromechanical systems (MEMS) components helps investigate the reliability of MEMS devices used especially in vital applications such as life-supporting, medical, aerospace or automotive technologies. This paper discusses the development and use of a hybrid micromechanical system that combines the advantages of a macroscale slow-action screw-driven stage producing large displacements with a small-scale fast-action piezo-driven actuator. The main advantage is to study mechanical properties of small structures such as thick and thin films developing cracks that travel on millimeter scale during fatigue. The combination of piezo position monitoring with image-recognition-based local deformation determination allows specification of the beginning of phenomena such as micro-void-induced softening with relative accuracy. Such studies are most useful for investigation of the onset of nucleation of microcracks from fatigue-induced surface flaws. The significance of finding the onset of crack propagation lies in the fact that crack initiation constitutes the major portion of fatigue life for small structures (occasionally up to 99.3%).



Topics: Microelectromechanical systems