Deformation and damage mechanisms of materials and structures

Preface

An engineering component or structure is often designed with a specified reliability. This ensures the component to perform its intended function throughout the design life. The deterministic design approach employs nominal or mean quantities when comparing the calculated stresses against the strength of the material, with an appropriate factor of safety. However, the continuous pursuit toward design optimization calls for improved performance with lighter structures and known reliability. In this respect, the knowledge of the response of the materials to the operating load and environment is indispensable for the safe operation of the structures. The mechanical response of the material consists of two aspects, namely the mechanics of deformation and the mechanism of the failure. Whereas the mechanics of the deformation have been considered in the classical design methods, the mechanism of the failure should also be accounted for in view of the desired optimized design.

In this respect, the Third Symposium on Damage Mechanisms of Materials and Structures 2018 was successfully organized to address numerous design-related issues on the response of the materials to the applied load and environment. This special issue of the *IJSI* compiles the current research reports on the method of assessing the damage in the materials, the characterization techniques and sample applications of the analysis to engineering structures. The assessment methods include the acoustic emission, the signal processing and the finite element (FE) analysis. Several characterization studies, including stress analysis by the FE simulation, limit-load analysis, tribological performance of new additives, wettability of new polymer coating and fatigue analysis under variable amplitude loading spectrum are highlighted. Reliability assessment of structures such as the concrete beam, automotive coil spring and the leaf spring is demonstrated.

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