

INVITED LECTURE

## **Fracture Mechanics based Characterization of Materials for Structural Integrity Assessment**

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### **ABSTRACT**

For health monitoring of structural components as per current codes for structural integrity assessment, it is imperative that characterization of the stability and growth of flaws be carried out. In this talk, a background of the necessity and the basics of fracture mechanics based quantification of resistance of materials will be presented. Failure, more often than not, ensues through the process of fracture. The process of fracture entails the initiation of a defect, which is called a crack as it approaches measurable dimensions. The crack further grows under service conditions of stress and environment, to ultimately result in total disintegration of a component or structure. The mechanisms through which a crack may form and grow under various modes of loading are important to be understood. In order to carry out structural integrity assessment, relevant data that characterizes the resistance to fracture of the material from which a component is manufactured is required. Fracture mechanics based methods of such characterization is particularly useful in this respect. A review of the methods employed is instructive from the standpoint of formalisms of fracture mechanics. It is also important to understand the various mechanisms that are responsible for fracture of materials, since they underline the process through which materials provide resistance to such eventualities. The talk will highlight some examples of fracture mechanics based characterization of engineering structural materials, and the application of such data for structural health assessment. Innovations that have to be employed for testing as well as analysis of data will be exemplified. Efforts at modelling the fracture behaviour of engineering materials will be presented.

