



Interfacial Mechanics for Multi-Material Structures

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Abstract

In recent years machines and structures are composed of various materials as the multi-material structures to improve function and performance. For design and production of the long term safety and reliable structures, it is important to understand the mechanical behavior of the multi-material structures such as failure and fracture. In this presentation, fracture mechanics approaches to the interfacial problems are briefly reviewed and a cohesive zone approach is presented. This model characterizes the interfacial mechanical properties and makes it possible to describe the fracture process on the interface. The interface fracture criteria based on the stress intensity factors and fracture toughness is discussed. The effects of the plastic deformation on the fracture boundary curve are examined. A several testing methods developed are also presented including multi-stage peeling test, new type adhesion testing, instrumented scratch testing and Nano-indentation testing. As an example of practical applications, investigation on adhesive films for semiconductor packages is presented.

Brief Biography

He is currently a Professor of the Department of Transdisciplinary Science and Engineering, Dean of School of Environment and Society, Tokyo Institute of Technology. He received his B.S. degree in 1975, M.S. degree in 1977, and Doctor of Engineering degree in 1982 from Tokyo Institute of Technology. He worked as a Research Associate and Associate Professor at Tokyo Institute of Technology from 1977 to 1995. During this period, he was a Visiting Scholar at Cambridge University from 1987 to 1988. He has published over 250 journal papers in the areas of applied mechanics, fracture mechanics, reliability of microelectronic devices, and others. He is the 94th President of Japan Society of Mechanical Engineers, a fellow of Society of Automotive Engineers of Japan and a fellow of American Society of Mechanical Engineers. He has also served and chaired on various scientific and technological committees promoting research and education.