The Department of Mechanical Engineering / College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar

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Integrity Assessment of Multi-Material Structures and Evaluation of Interfacial Strength

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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. Multilayer structures composed of thin polymer films are also widely used in many fields. In this presentation, fracture mechanics approaches to the interfacial problems of are briefly reviewed and a several testing methods developed for thin polymer films are presented including multi-stage peeling test, new type adhesion testing, instrumented scratch testing and Nano-indentation testing. A method for evaluating interface strength is presented taking into account of strain rate dependencies of adhesives. A method to evaluate the mechanical properties of films through inverse approach is also presented. Some results obtained by our group are presented. Experimental results evaluated by using two-axes-driven peel method and the effects of corona treatment and thickness of films are shown. Surface scratch testing results by instrumented testing machine developed are shown and the relationship between damage and scratch friction coefficient is discussed. Strength and peeling properties of adhesives is also investigated with probe tack test developed and the effect of pre-tension are examined. As an example of practical applications, investigation on adhesive films for semiconductor packages is presented.

Biography

Dr. Kishimoto received Bachelor and Master of Engineering from Tokyo Institute of technology in 1975 and 1977. He became a research associate in 1977 and then received Doctor of Engineering in 1982. He has been Professor of Engineering since 1995. Professor Kishimoto has made many major contributions in the fields of applied mechanics, materials engineering and electronic packaging. His scientific accomplishments are numerous over last 40 years coving analytical, computational and experimental investigations. He has received high appraisals from the international community and won several awards for his research works. Recently he was awarded prestigious JSMS Award to Academic Contribution by Japan Society of Materials Science (2006) and Japan Society of Mechanical Engineers (JSME) Materials and Mechanics Division Achievement Medal in (2007). Dr. Kishimoto was the Editor of Transaction of JSME (1999-2000) and Associate Editor of ASME Journal of Electronic Packaging (2002-2006). He is a fellow 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 is a member of Science Council of Japan and serving as a chairman of mechanical engineering committee. He has served and chaired on various scientific and technological committees promoting research and education. He is a vice-president of Japan Accreditation Board for Engineering Education (JABEE).

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