CALCE Web Seminar:

Moisture Ingress, Behavior and Prediction in Polymeric Materials of Semiconductor Packaging

Date and Time:

April 17th start at 11:00am U.S. Eastern (8:00am U. S. Pacific)

Telecon and Webex :

Call-in number and URL to be announced

Reliability issues associated with moisture have become increasingly important as advanced electronic devices are nowhere more evident than in portable electronic products. The transition to the Pb-free solders, which requires higher reflow temperature, makes the problem further exacerbated. Moisture absorbed into semiconductor packages can initiate many failure mechanisms, in particular interfacial delamination, degradation of adhesion strength, etc.

The absorbed moisture can also result in catastrophic crack propagation during reflow process, the well-known phenomenon called *pop-corning*. High vapor pressure inside pre-existing voids at material interfaces is known to be a dominant driving force of this phenomenon. It is also known to cause interconnection failure in the flip chip package, where delamination initiated from air-trapped cavities within underfill grows unstably during reflow process. Although there have been numerous researches on dynamic interactions between the void pressure and the crack propagation, the moisture behavior inside and around the void is not yet clearly understood, i.e., how water accumulates inside the void.

The first half of this seminar presents a review and a brief quantitative assessment on various existing mechanisms of water accumulation inside voids at polymer interfaces from the chemical potential point of view. They include condensation, adsorption, capillary, microfogging, and quick diffusion.

The second half will be devoted to the standard procedures to obtain the critical hygroscopic properties as well as advanced numerical modeling schemes to analyze the moisture diffusion phenomenon using the thermal-moisture analogy as well as the mass diffusion.

About the speaker: Dr. Bongtae Han received his Ph.D. degree in Engineering Mechanics from Virginia Tech. He is currently a Professor of the Mechanical Engineering Department of the University of Maryland at College Park and one of Research Directors of the Center for Advanced Life Cycle Engineering (CALCE). His research interest is centered on design/process optimization of microelectronics devices for optimum mechanical reliability.

Dr. Han served as an Executive Board Member and the Chairman of the Electronic Packaging Division of the Society for Experimental Mechanics (SEM). He served as an Associate Technical Editor for the international journal, Experimental Mechanics, from 1999 to 2001 and is currently serving as an Associate Technical Editor for Journal of Electronic Packaging, Transaction of the ASME.

He received the IBM Excellence Award for Outstanding Technical Achievements in 1994. He was a recipient of the 2001 Brewer Award, presented at the Annual Conference of the SEM in Emerging Technologies, for his contributions to experimental characterization of microelectronics devices. He also received the 2005 Associate Editor of the Year Award from the ASME. His publication awards include the Year 2004 Best Paper Award of the IEEE Transactions on Components and Packaging Technologies, and the Gold Award (best paper in the Analysis and Simulation session) at the 1st Samsung Technical Conference in 2004.

Dr. Han is a *Fellow* of SEM and holds a membership of IEEE, ASME and SPIE.