

16. AGEING OF POLYMERS AND THE INFLUENCE ON MICROELECTRONIC PACKAGE RELIABILITY

Course Leaders: Tanja Braun and Ole Hölck – Fraunhofer IZM

Course Objective:

Many electronic products used in different applications, such as automotive, medical, and some consumer are exposed to extreme loading profiles. High temperatures, random vibrations or humid and or wet environments affect system and materials. Lifetime demands of 10 years and above in combination with these challenging environments requires well known materials and broad knowledge on their behavior over the entire lifetime. Polymers are widely used in microelectronics packaging e.g. as interconnect material, encapsulant or substrate. But polymers age with time, temperature and humidity. Ageing entails a change in properties including mechanical, thermo-mechanical or adhesion characteristics, all of which are key factors for reliable package solutions. Hence, knowledge on materials and their ageing behavior is essential for developing reliable microelectronics packages and systems.

Course Outline:

1. Introduction of Polymers used in Microelectronics
2. Important Aspects of Encapsulation Technologies for Reliable Packaging
3. Ageing Mechanisms of Polymers
4. Adhesion and Interface Degradation
5. Test Methods and Selection Criteria for Polymers in Microelectronics Packaging
6. Overview of State-of-the-Art Measurement Equipment
7. Moisture and Temperature Induced Changes in Material Properties
8. Lifetime Simulation by FEM taking Polymer Degradation into Account
9. Failure Mechanisms Related to Polymer Ageing

Who Should Attend:

The course is targeted for engineers and engineer management in the field of microelectronic package design, development and reliability engineering. The attendees will learn about material selection, polymer ageing and the related influence on package reliability and will gain knowledge on how to build high reliable packages.

Bio 1:

Tanja Braun studied mechanical engineering at Technical University of Berlin with a focus on polymers and micro systems and joined Fraunhofer IZM in 1999. Since 2000 she is working with the group Assembly & Encapsulation Technologies and since 2016 she is head of this group. Her field of research is process development of assembly and encapsulation processes, the qualification of these processes using both non-destructive and destructive tools and advanced polymer analysis. Recent research is focused on wafer and panel level packaging technologies and Tanja Braun is leading the Fan-out Panel Level Packaging Consortium at Fraunhofer IZM Berlin. In 2013 she received her Dr. degree from the Technical University of Berlin for the work focusing on humidity diffusion through particle-filled epoxy resins. Results of her research concerning packaging for advanced packages have been presented at multiple international conferences. Tanja Braun holds also several patents in the field of advanced packaging. In 2014 she received the Fraunhofer IZM research award.

Bio 2:

Ole Hölck studied physics at University Göttingen and received his diploma in 2000. He worked for the Federal Institute for Material Testing and received in 2008 his Dr. degree from the

Technical University of Berlin for the work focusing on sorption and swelling of polymers. In 2008 Ole Hölck joined Fraunhofer IZM. His work focuses on advanced material testing and simulation methods. Results of his research concerning materials for advanced and reliable packaging have been presented at multiple international conferences.