MATERIALS ENGINEERING SEMINAR

"Development of Hierarchical Microstructural Fingerprints for Secure Microelectronics Packaging"

Min Woo Cho, MSE Preliminary Exam

Advisors: Professor Nikhilesh Chawla

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ABSTRACT

Counterfeiting in modern microelectronics poses a potential threat to semiconductor industries. This includes tampering, cloning, or remarking on existing electronic packages to steal intellectual properties. It costs billions of dollars annually for semiconductor industries from damaged and subpar electronics. In addition, this creates security threats for electronic package security utilized by the military. Researchers developed different ways to detect counterfeiting by creating different security patterns on electronic packages. Quick response (QR) codes and markings are few prime examples to detect counterfeiting. However, current approaches have limitations due to easy detection by counterfeiters or long authentication times. Therefore, a more robust method for security electronic packages is needed. Hierarchical microstructures can be used to develop fingerprint for securing electronic packages. Here, we address new direction of research in this area using x-ray computed tomography. Specifically, we discuss a novel method using x-ray radiation curing of photopolymers with Tantalum particles. The proposed method first outlines the driving force of polymerization. X-ray interaction with Tantalum particles create ionization effect to trigger polymerization mechanism for the resin system. Furthermore, we present a unique way to create a key for the fingerprint using n-point correlation function on the x-ray projections to statistically quantify particle distribution.

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