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Relationship Between Interfacial Strength and Materials Properties in Hybrid Organic/Inorganic Nanomaterials CHAD SNYDER, MICKEY RICHARDSON, JING ZHOU, GALE HOLMES, ALAMGIR KARIM, NIST Polymers Division, NANDIKA D'SOUZA, University of North Texas, Dept. of Materials Science and Engineering — Thermal interface materials (TIM's) are critical to the semiconductor electronics industry for heat dissipation, a potential show-stopper for future technology nodes. Essentially, an epoxy nanocomposite, TIMs suffer from a series of typical nanocomposite limitations including heat conduction in nanoscale inclusions, nanoparticle dispersion, void formation with thermal cycling, and interfacial resistance between the matrix and filler. It is postulated that the interfacial adhesion between the matrix and nanofiller is at the root cause of many of these difficulties, however, few techniques exist to characterize this critical property. Compounding this are the overall difficulties associated with characterizing these materials in their ultimate applications, i.e., thin films. To this end, a novel series of organic/inorganic hybrid nanostructured materials based on layered double hydroxides in epoxy matrices were designed as a test bed to develop the measurement techniques needed to elucidate the relationship between the material structure and dynamics and the ultimate materials properties. Initial results are presented based on characterization by mechanical, dielectric, and thermal spectroscopies.

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