

## **High-performance epoxy-based composites as underfill materials for electronic packaging**

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### **Abstract**

The integrated circuits industry is continuously producing ever smaller microelectronic devices with ever higher power and greater packaging density. The performance reliability and stability of these new devices are affected by basic issues such as thermal heat dissipation, stress redistribution, signal transmission and mechanical protection. Different thermal management strategies have been proposed in recent years to overcome these issues. However, those approaches cannot be effectively applied to the complex underfill process that is an integral part of electronic packages. Fine control of the combined mechanical-thermal-electrical-processing-dielectric performance criteria of site-specific underfill materials for flip-chip packaging has proven very challenging. Many bottlenecks still exist. Herein, we review the state-of-the-art advances regarding the key requirements of underfill materials for microelectronic devices and identifying yet unresolved problems, especially 3D integrated structures.