Thermal Interface Materials

Packaging of semiconductor power electronic device is a challenge due to the progressive increase in the power level of operating devices. In the near future, the power level will rise to about 200 W, or about an effective power density of 500 W/m².

In high-power electronics module packages, the heat generated by the power device is transferred to the ambient environment by attaching a heat spreader to the semiconductor package. The heat spreader is attached to the chip using a thermal interface material (TIM). It has been found that the TIM contributes ~50% to the thermal impedance of a complete package. Proper selection of TIM can be crucial for the device efficiency; and instead of having a big heat sink with sophisticated cooling technique; it is better to invest on the interface material.

The Advanced Energy Materials team in Tyndall National Institute is actively involved in researching novel thermal interface materials. The SEM image shown above is the nanowire-polymer composites fabricated in Tyndall. In this activity, the Advanced Energy Materials team is working on the fabrication and characterization of thermal interface material systems using different types of nanotubes and nanowires as filler material.

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Related Publications

- Nanowire-Polymer Nanocomposites as Thermal Interface Material
  Advances in Nanocomposites - Synthesis, Characterization and Industrial Applications (2011)
  Authors: Kafil M., Eric Dalto

- Silver nanowire array-polymer composite as thermal interface material
  Authors: Ju Xu, Alessio Munari, Eric Dalton, Alan Mathewson, Kafil M. Razaeb