

Theme : Functional Materials

Subject : Thermal Management Materials

Introduction

The goal of this research project is to explore novel materials and/or novel device architecture that can solve problems related to heat generations in microelectronics.

In case of the novel materials, we expect the heat absorbing materials and/or thermoelectric materials to go beyond the existing commercialized products. In case of the novel device architecture, we expect the massive heat removal in microelectronics using the existing commercialized materials.

Scope

Challenges that significantly advance the state-of-the-art heat dissipation packaging materials and architecture technology in microelectronics:

- Methods to overcome the current heat dissipation capacity in microelectronics.
- Verification of new materials and/or new architecture mechanism
- Methods to provide a novel architecture to establish mobile electronic devices and semiconductor packaging process
- Consideration of performance and cost at the same time when designing materials and/or architectures
- Minimum heat removal performance : 1 W/cm²
- Operating temperature ranges : 30C ~ 80C

Research questions

We are interested in the following research questions. These questions are not exhaustive but different research questions are open to discuss with research partners.

- What would be strong candidate ways for a large heat generating microelectronic devices?
- What would be the most effective way to decrease maximum operating temperature of microprocessors in terms of cost, packaging process, and/or performance?
- What would be the most promising method for cost effective heat removal?

Expected Deliverables

The following is open to discussion:

- Suggestion of new materials or new structure
- Detailed progress reports every 3 months summarizing accomplishments.
- Prototype samples
- Patents with Samsung Electronics (if agreed)