Growth and thermal characterization of CNT on Graphene film

Since tremendous heat fluxes generated from the integrated chips, critical thermal issues are threatening the performance and lifetime of electronic devices. There is a significant need for high performance heat spreading materials in electronic cooling applications to efficiently transport excessive heat away from power components and thereby reduce the working temperature of electronics. To achieve that, large-area, freestanding and high thermal conductive graphene based films (GBFs) were fabricated and applied as a novel heat spreading material in this EMSL group. Thermal conductivity of GBFs reaches over 2000 W/mK which is superior to many currently existing high thermal conductive materials, such as copper, aluminum, and commercial graphite sheets. In spite of the extraordinary properties of GBF, the application of GBF in portable electronics, such as mobile phone, laptop, and many other power electronics, needs to understand the long-term reliability of the material since it has huge effect to the lifetime of electronic devices. Cooling failure of the GBF could lead to the dramatically increased working temperature of electronic devices and cause irreversible damage to the system. In this thesis, a growth study is planned on the graphene film to increase the bonding and thermal performance of the stacked graphene film. The work approach is as follows:

Growth of CNT
Functionalization of the CNT and graphene film
Lamination of the sandwich structure of CNT and graphene film
Thermal characterization of the sandwiched structure

Starting points:

- Get license from the clean room at MC2
- Learn the CNT growth
- Learn the functionalization
- Learn the lamination process
- Learn the thermal characterization methodology using self-heating (IR) and laser flash methods.
- Planning of the experimental work and iterations
- Characterization

Time: Dec 2020/Jan 2021 to May 2020/June 2021

Duty:

- Reporting: Regular biweekly report
- Main responsible for the experimental execution.

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