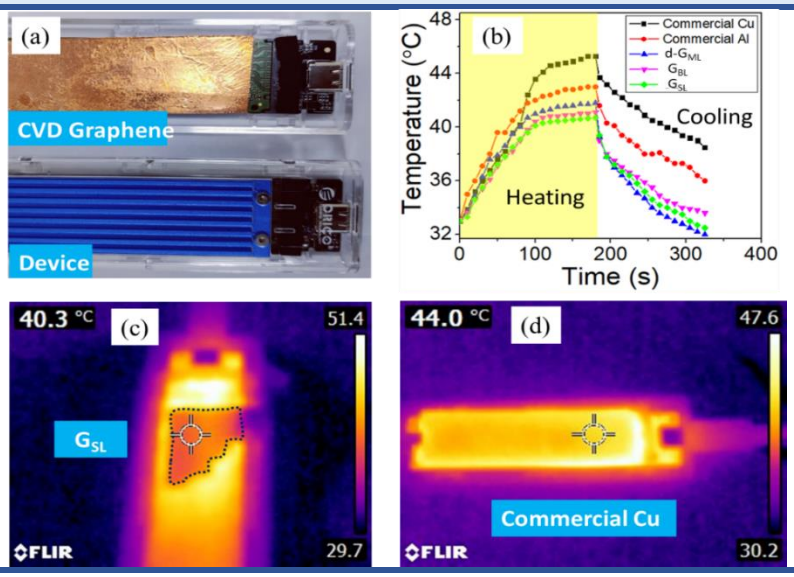
RTP-CVD Graphene (Bi-layer to few layer) as flexible lightweight heat sink applications

WP: 3.4 **TRL: 4/5**



(a) Commercial aluminium heat sink and RTP-CVD graphene (NVMe M.2 High Performance PCIe SSD , upto 10 Gbps, 108 (L) x 34 (w) x 11.5 (H) mm) photographs. (b) Different heat sink temperature profiles against time. Photographs of (c) GSL and (d) commercial Cu heat sink under thermal IR camera.

Specific Features of Technology Developed (Benchmarking USP) (in bullets)**:**

We demonstrated using RTP-CVD-produced GFs as a heat sink on a 2-terabyte solid-state drive (NVMe M.2 TCM2-C3) and achieve a data transfer rate of 10 Gbps (figure). For the temperature measuring procedure, the heat was generated by transferring 40 GB of data from the laptop to the 2TB SSD for 3 minutes. After 3 minutes, commercial Cu, commercial aluminium, d-GML, GBL, and GSL heat sinks were used to monitor the 2TB SSD's temperature (figure). Since GSL film provides a large area for heat to be exchanged, it is useful for dissipation. The GSL-mounted 2TB SSD ran the coolest of all drives. The GSL film can remove heat from an object at a rate that is 200 times faster than that of a heat sink made of Cu. The 2TB SSD maintains a stable temperature thanks to the GSL film heat sink's rapid heat dissipation.

Technical Details and TRL:

- A RTP-CVD grown, Bi-Layer & MultiLyaer graphene on Cu foils as direct use for thermal management applications.
- Demonstrated upto 4 inch size, scalable to larger size.
- Best in class for micro cavity extraction based thermal management devices.

Applications of Technology and Impact:

To increase reliability and avoid early failure, thermal management is necessary for all digital equipment and circuitry. If there are no additional energy interactions, the output of heat is equal to the input of power. Different types of heat sinks, thermoelectric coolers, forced air systems and fans, heat pipes, and other cooling methods are available. The retail heat sink market has risen to an all-time high as a result of recent technology advancements and rising public interest. The need for high-quality cooling systems increased in the early 2000s as CPUs started to create more heat than before. Because overclocked chips run hotter by nature, there have always been higher cooling requirements and enthusiast worries. Effective heat sinks are essential for various electrical and electronics and power management solution, etc can function without experiencing instability, the higher its performance will be in general.

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