Researcher Finds Faster, Cheaper Way To Cool Electronic Devices

A North Carolina State University researcher has developed a more efficient, less expensive way of cooling electronic devices – particularly devices that generate a lot of heat, such as lasers and power devices.

The technique uses a “heat spreader” made of a copper-graphene composite, which is attached to the electronic device using an indium-graphene interface film “Both the copper-graphene and indium-graphene have higher thermal conductivity, allowing the device to cool efficiently,” says Dr. Jag Kasichainula, an associate professor of materials science and engineering at NC State and author of a paper on the research. Thermal conductivity is the rate at which a material conducts heat.

In fact, Kasichainula found that the copper-graphene film’s thermal conductivity allows it to cool approximately 25 percent faster than pure copper, which is what most devices currently use.

Dissipating heat from electronic devices is important, because the devices become unreliable when they become too hot.

The paper also lays out the manufacturing process for creating the copper-graphene composite, using an electrochemical deposition process. “The copper-graphene composite is also low-cost and easy to produce,” Kasichainula says. “Copper is expensive, so replacing some of the copper with graphene actually lowers the overall cost.”

The paper, “Thermal Conductivity of Copper-Graphene Composite Films Synthesized by Electrochemical Deposition with Exfoliated Graphene Platelets [1],” is published in *Metallurgical and Materials Transactions B*. The research was funded by the National Science Foundation.

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