
Cooling Electronics Efficiently with Graphene-Enhanced Heat Pipes

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Researchers at Chalmers University of Technology, Sweden, have found that graphene-based heat pipes can help solve the problems of cooling electronics and power systems used in avionics, data centres, and other power electronics.

"Heat pipes are one of the most efficient tools for this because of their high efficiency and unique ability to transfer heat over a large distance," says Johan Liu, Professor of Electronics Production, at the Department of Microtechnology and Nanoscience – MC2, at [Chalmers](#). The results, which also involved researchers in [China](#) and [Italy](#), were recently published in the scientific Open Access journal [Nano Select](#).

Electronics and data centres need to be efficiently cooled in order to work properly. Graphene enhanced heat pipes can solve these issues. Currently, heat pipes are usually made of copper, aluminium or their alloys. Due to the relatively high density and limited heat transmission capacity of these materials, heat pipes are facing severe challenges in future power devices and data centres.



Fig. 1. Graphene-enhanced heat pipes can efficiently cool power electronics.

Large data centres that deliver, for example, digital banking services and video streaming websites are extremely energy-intensive, and an environmental culprit that emits more than the aviation industry. Reducing the climate footprint of this industry is therefore vital. The researchers' discoveries here could make a significant energy efficiency contribution to these data centres, and in other applications too.

The graphene-enhanced heat pipe exhibits a specific thermal transfer coefficient which is

about 3.5 times better than that of copper-based heat pipe. The new findings pave the way for using graphene enhanced heat pipes in lightweight and large capacity cooling applications, as required in many applications such as avionics, automotive electronics, laptop computers, handsets, data centres as well as space electronics.

The graphene-enhanced heat pipes are made of high thermal conductivity graphene assembled films assisted with carbon fibre wicker enhanced inner surfaces. The researchers tested pipes of 6mm outer diameter and 150mm length. They show great advantages and potential in cooling of a variety of electronics and power systems, especially where low weight and high corrosion resistance are required.

"The cold part of the graphene enhance heat pipe can be substituted by a heat sink or a fan to make the cooling even more efficient when applied in a real case," explains Ya Liu (picture to the right), PhD Student at the Electronics Materials and Systems Laboratory at Chalmers.

Read the [original article](#) on Chalmers University of Technology.