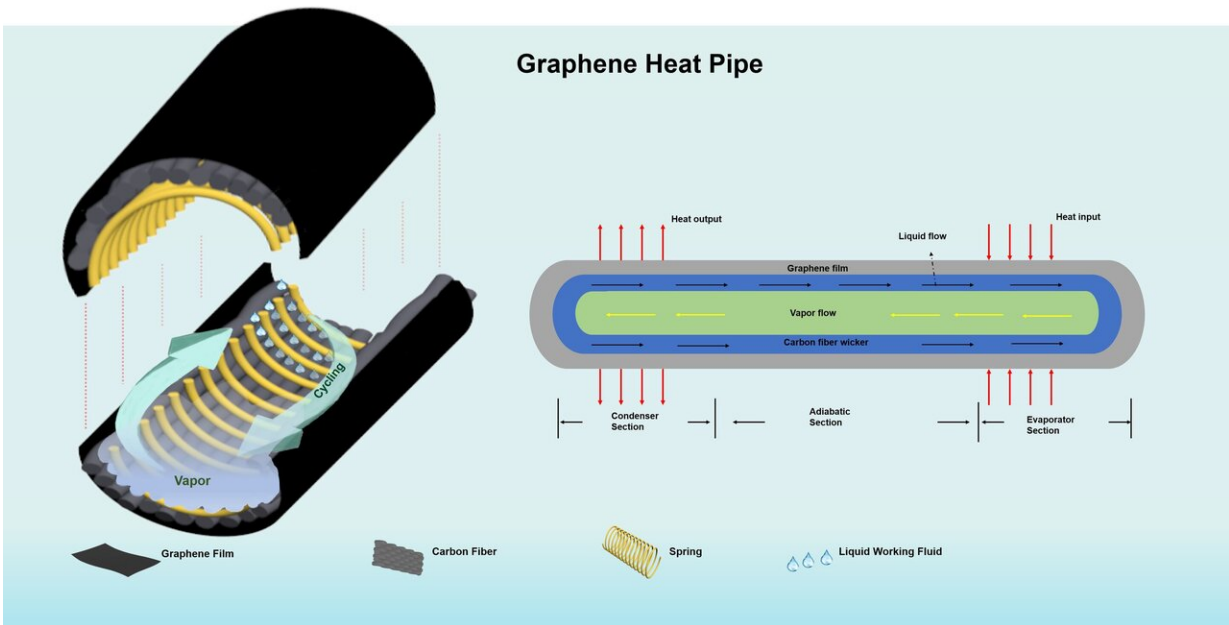


# Cooling electronics efficiently with graphene-enhanced heat pipes

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Graphene enhanced heat pipes can efficiently cool power electronics. Credit: Ya Liu/Johan Liu/Chalmers University of Technology

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 centers and other power electronics.

"Heat pipes are one of the most efficient tools for this purpose, 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 at Chalmers.

The results, which also involved researchers in China and Italy, were recently published in the open access journal *Nano Select*.

Electronics and data centers 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, aluminum 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 centers.

Large data centers that deliver, for example, digital banking services and video streaming websites, are extremely energy-intensive, and an environmental culprit with greater emissions 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 centers, 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 centers 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

for cooling of a variety of electronics and [power systems](#), especially where low weight and high corrosion resistance are required.

"The condenser section, the cold part of the graphene enhanced 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, Ph.D. Student at the Electronics Materials and Systems Laboratory at Chalmers.

**More information:** Ya Liu et al, A lightweight and high thermal performance graphene heat pipe, *Nano Select* (2020). [DOI: 10.1002/nano.202000195](#)

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