

New technology platform for molecule-based electronics

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Researchers at the Nano-Science Center at the University of Copenhagen have developed a new nano-technology platform for the development of molecule-based electronic components using the wonder material graphene. At the same time, they have solved a problem that has challenged researchers from around world for ten years.

Since its discovery in 2004, [graphene](#) has been called a wonder material, in part because it is 200 times stronger than steel, a good [electrical conductor](#) and is just a single atom layer thick. With these properties, there are sky-high expectations for what graphene can be used for. That is why researchers around the world are working on developing methods to make and modify graphene. In a recently published article in the journal [Advanced Materials](#), researchers in nano-chemistry at the Department of Chemistry describe how they are among the first in the world to be able to chemically produce large flakes of graphene.

"Using chemical and [physical processes](#), that we have been working to develop in recent years, we are now able to produce such large flakes of graphene that we can use the flakes as components in an entirely new [technology platform](#) within molecule-based electronics, " says nano-chemist Kasper Nørgaard, who along with his Danish and Chinese colleagues in the Danish-Chinese Center for Molecular Nano-Electronics at the Nano-Science Center, is behind the new platform as well as the solution to ten year old problem.

More than 10 years ago when it was being proclaimed that

nanotechnology could revolutionise computer technology, it was in part because they imagined that the development of molecular electronics was just around the corner. Molecular electronics involves replacing traditional electrical components with molecules, creating tiny electronic circuits for use in, for example, computers and data storage. This has proven to be more challenging than anticipated, in part because the components short-circuited when the molecules were contacted with electrodes and were therefore unable to create a workable circuit. Graphene is the solution to the problem.

"We can now place one of our graphene flakes on top of the molecules, protecting the system from short circuits. That is how we developed a new technology platform for use in the development of new electronics based on molecules," says Kasper Nørgaard, who explains that in the Danish-Chinese collaboration, they are trying to use molecules with different properties in the platform, for example, molecules that can alternate between being conductive and non-conductive. This paves the way for the electronics of the future in areas such as memory technology, ultra-thin displays and solar cells.

Provided by University of Copenhagen

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