

# Super graphene can help treat cancer

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Student Elise Ramleth Østli and PhD candidate Federico Mazzola check their experiment. As part of her master's project at NTNU, Elise Ramleth Østli spent time in Stockholm, studying the tubes used with intravenous catheters. Back at NTNU, she contacted Justin Wells at the Department of Physics, asking if he was interested in continuing studies on these types of medical materials. Credit: Per Henning/NTNU

Silver is often used as a coating on medical equipment used for chemotherapy. The problem is that this silver coating can break down drugs. Now, researchers have found a graphene coating that will help boost chemotherapy's effects.

Chemotherapy treatment usually involves the patient receiving medicine through an intravenous catheter. These catheters, as well as the the equipment attached to them, are treated with a silver coating which is antibacterial, preventing bacterial growth and unwanted infections during a treatment.

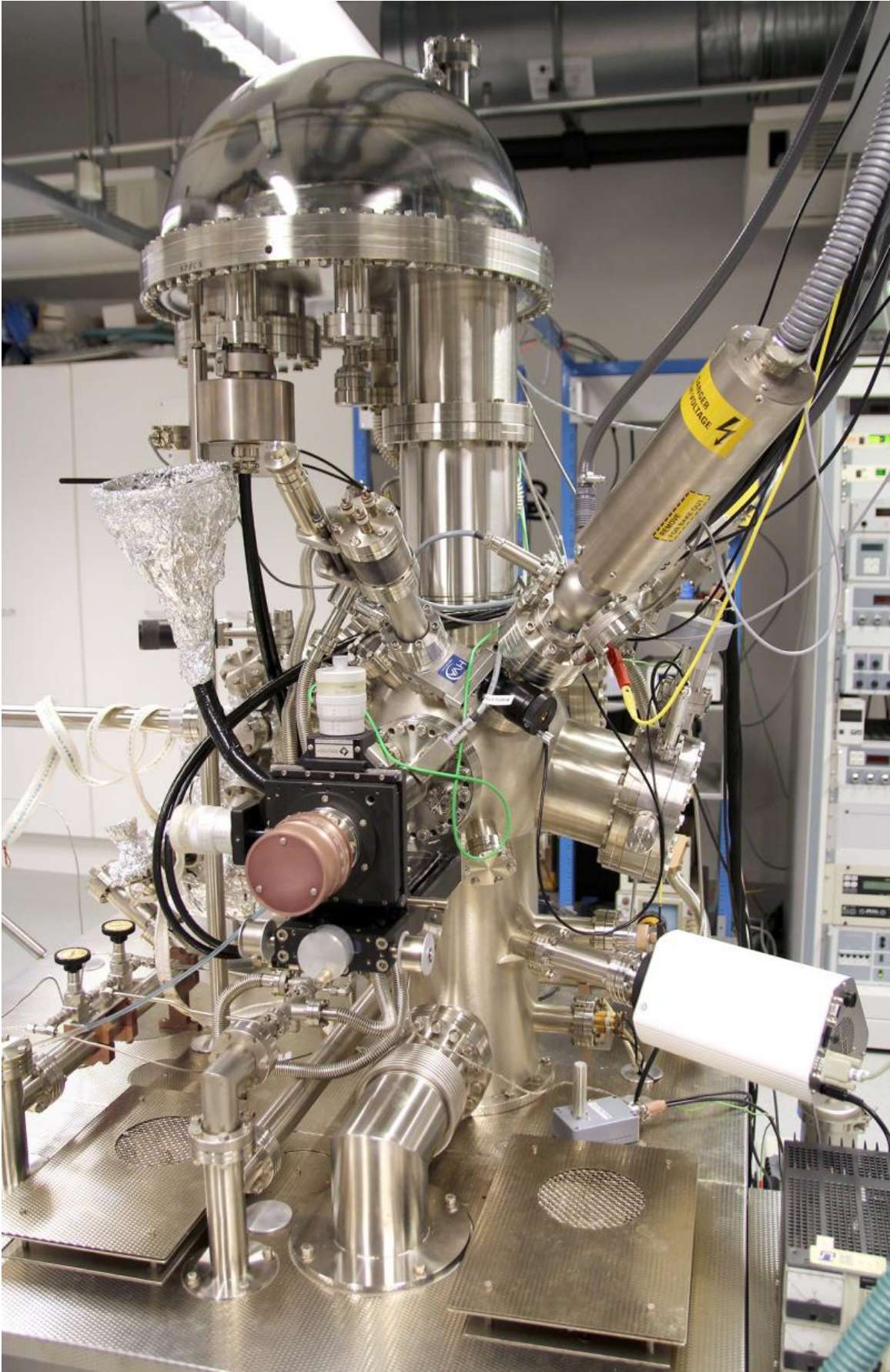
Researchers at the Norwegian University of Science and Technology's (NTNU) Department of Physics are now studying what happens when different drugs come in contact with this silver coating.

## **Silver breaks down chemotherapy drugs**

"We wanted to find potential problem sources in the tubes used in intravenous catheters. An interaction between the coating and the drugs was one possibility. Chemotherapy drugs are active substances, so it isn't hard to imagine that the medicine could react with the silver," says Justin Wells, an associate professor of physics at NTNU.

Wells and his students used x-ray photoemission spectroscopy (XPS) to look at the surface chemistry of one of the most commonly used chemotherapy drugs, 5-Fluorouracil (5-Fu), and the interaction between it and the type of silver coating found in medical equipment.

Using an XPS instrument at the synchrotron lab MAX IV in Sweden, they found that the antibacterial silver coating actually breaks down the drugs. Not only does this reduce the effect of a [chemotherapy treatment](#), but it also creates hydrogen fluoride, a gas that can be harmful both to the patients and to the medical equipment.



X-ray photoemission spectroscopy (XPS). Credit: Per Henning/NTNU

"Reactions between chemotherapy drugs and other substances that the drugs come in contact with have, as far as we know, never been studied like this before," Wells says. It has always been assumed that the drugs reach the body fully intact.

## Magical material

The group continued their studies with the XPS instrument, now examining how the same chemotherapy drugs reacted with graphene.

"Graphene is a non-reactive substance, and is sometimes referred to as a magical material that can solve any problem. So we thought that it might be a good combination with the chemotherapy drugs," Wells explains.

And they were right—the drugs did not react with the graphene.

Graphene has already been suggested as a coating for medical equipment, and according to researchers, it should be possible to create thin layers of graphene designed for this use.

"This research has produced valuable information about the interaction between [chemotherapy](#) drugs and other substances that the medicine is in contact with. We hope that our work will contribute to making cancer treatment more effective, and that we can continue our work in this area. We would like to study the reaction between [chemotherapy drugs](#) and other substances and coatings used on [medical equipment](#)," Wells concludes.

**More information:** "Graphene coatings for chemotherapy: avoiding silver-mediated degradation." *2D Materials*, Volume 2, Number 2. [DOI: 10.1088/2053-1583/2/2/025004](https://doi.org/10.1088/2053-1583/2/2/025004)

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