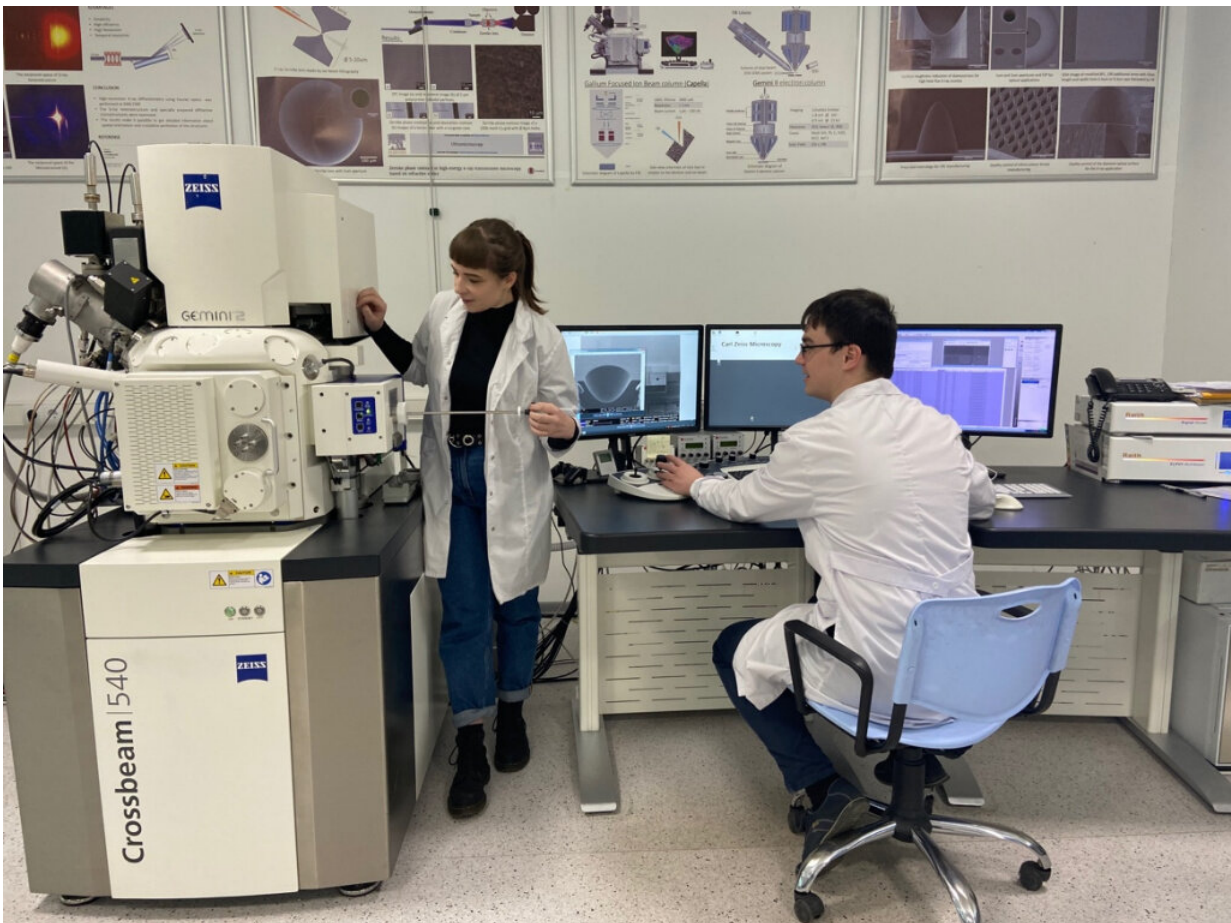


Scientists create the first diamond X-ray micro lens

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Credit: Immanuel Kant Baltic Federal University

After fourth-generation synchrotrons were invented (these are particle

accelerators, which are, in fact, giant research facilities), there was an urgent need for a fundamentally new optics that could withstand high temperatures and radiation loads created by a powerful X-ray stream.

Scientists use metal and polymer lenses, but they are short-lived and the image they produce is distorted.

Several days ago the *Optics Express* [scientific journal](#) published an article by IKBFU scientists who offered a new innovative method of diamond X-ray microlens production.

Polina Medvedskaya, a scientist at the "Coherent Optics for Mega science-class plants" research center told us: "A diamond is a unique and expensive material. But it is almost indestructible which makes the [lens](#) made of it more economically profitable than metallic or polymeric ones in the long run. The problem is that a diamond is the hardest material on the planet and it is extremely difficult to process. But we have found a way to do it. The IKBFU scientists used an electron-ion [microscope](#) (FIB) to process it."

Another scientist from the center Ivan Lyatun explained: "It is concerning for a layman how is it possible to process something by using a microscope? But we have the microscope set on certain configurations that allows it not only to be used as a tool for analysis, but also to shape objects in the necessary form. Using microscopes like this one we make ultra-thin, nano-level cuts. And so we decided to make a microlens."

The result exceeded scientists' expectations. A series of thinner-than-human-hair lenses were produced and may be used in the most powerful synchrotrons and X-ray lasers. According to the scientists, the use of lenses made by them will make it possible to obtain more detailed information about any material—to study the structure of nanostructures, to obtain maximum information about protein crystals,

which will make it possible to synthesize new drugs.

In a word, new diamond lenses will allow us to penetrate deeper into the secrets of matter, to find out what was previously hidden from the eyes of man.

More information: Polina Medvedskaya et al, Diamond refractive micro-lenses for full-field X-ray imaging and microscopy produced with ion beam lithography, *Optics Express* (2020). [DOI: 10.1364/OE.384647](https://doi.org/10.1364/OE.384647)

Provided by Immanuel Kant Baltic Federal University

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