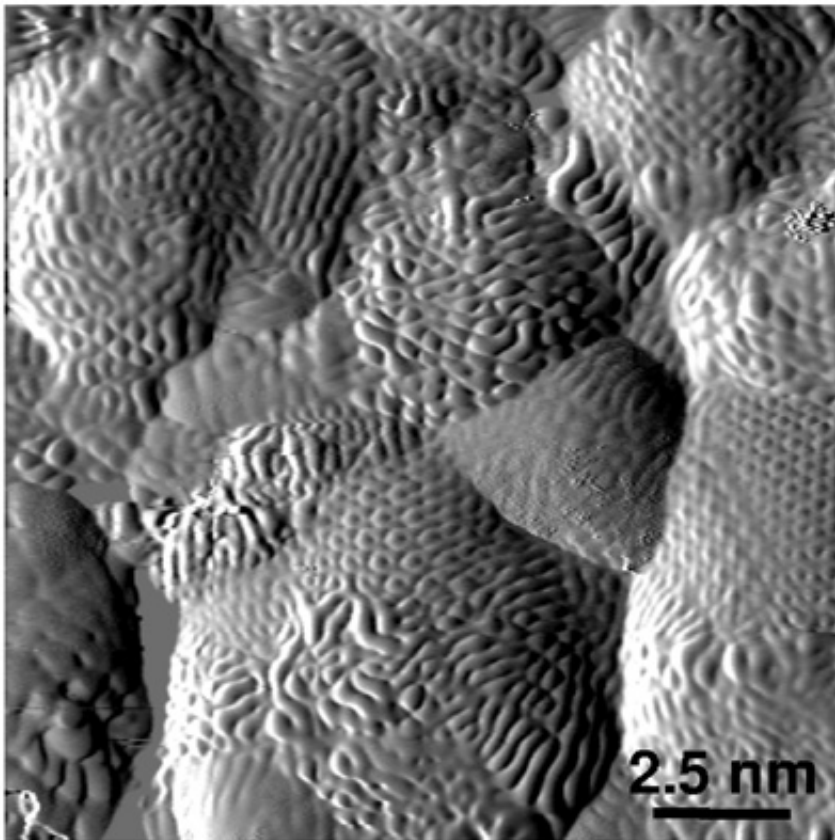


Electrified diamonds: Physicists on the trail of quantum information

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Scanning tunneling microscopy image showing the surface structure of nanodiamonds.

With the help of tiny diamond crystals, physicists at the University of Basel have discovered new possibilities of quantum information: The scientists discovered at specific circumstances electric currents that

made it possible to identify defects in the carbon lattice of single diamonds measuring only a few nanometers. The results have been published online in the magazine *Nano Letters*.

The team from the University of Basel and the French German Research Institute St. Louis (ISL) investigated [diamond crystals](#) of the size of only five nanometers (five millionths millimeter) using scanning tunneling microscopy and [atomic force microscopy](#). The physicists then identified the atomic structure of the surface and observed crystalline, hexagonal carbon facets as well as graphitic reconstructions. In doing so, they discovered extra currents at specific voltages when the crystals were illuminated by green light.

These extra currents are related to the presence of defects in the carbon lattice of diamonds, so called Nitrogen-vacancy centers (NV-centers) that are optically active. These centers are promising candidates for future applications in [quantum information](#) processing systems, spin-magnetometry sensors or single photon sources. Their identification in the range of less than ten [nanometers](#) would have been very difficult with conventional methods, which is why the scientists applied a combination of different methods.

"With this study, we are able to show that it is possible to prove, with high resolution, the presence of optical centers in single nanodiamonds", says Prof. Ernst Meyer of the Department of Physics at the University of Basel. In the future, NV-centers could be used in quantum computers that work much more efficiently than conventional computers.

More information: "Local Detection of Nitrogen-Vacancy Centers in a Nanodiamond Monolayer." Rémy Pawlak, Thilo Glatzel, Vincent Pichot, Loïc Schmidlin, Shigeki Kawai, Sweetlana Fremy, Denis Spitzer and Ernst Meyer. *Nano Lett*, 2013 Oct 24, [DOI: 10.1021/nl402243s](https://doi.org/10.1021/nl402243s)

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