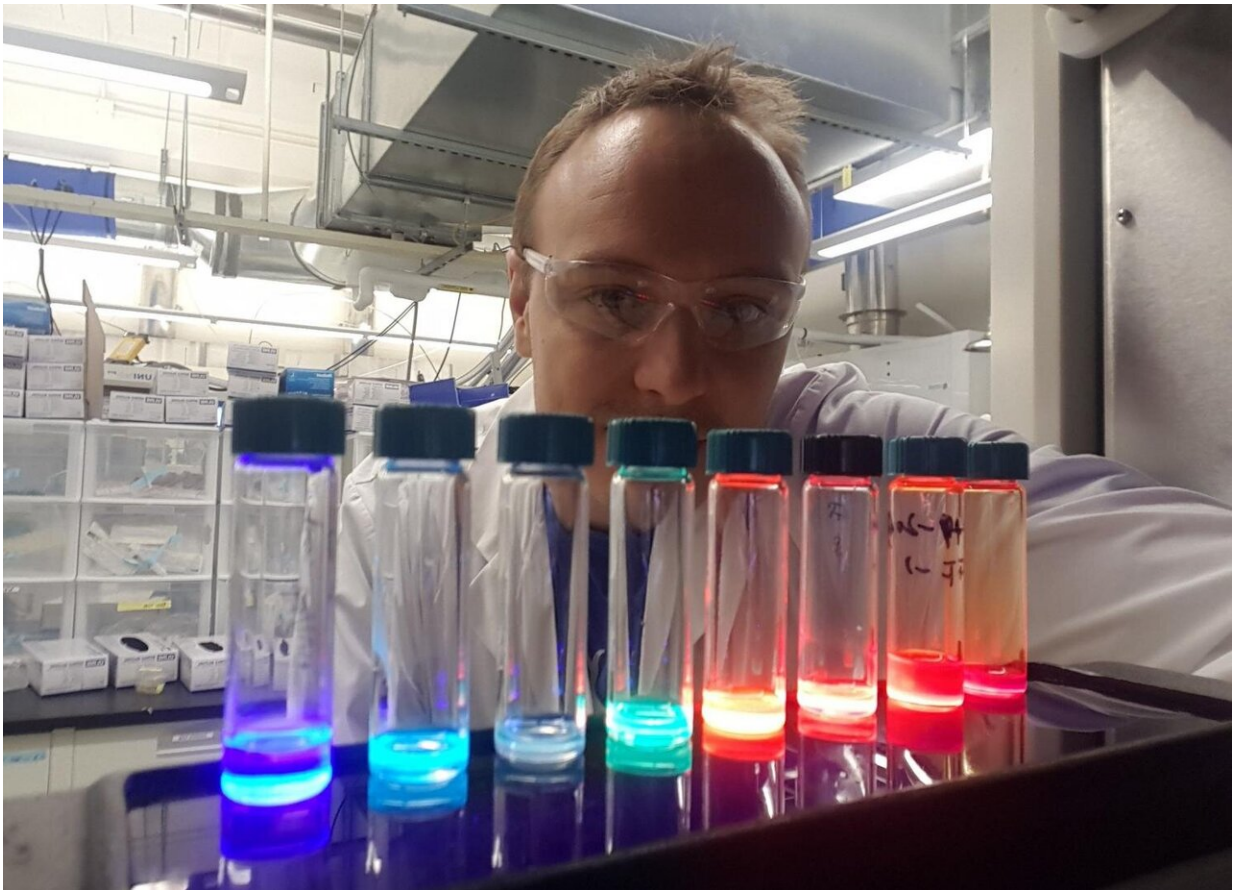


Quantum dots technology to revolutionize healthcare and sensing technology

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Credit: University of Oulu

Researchers of the Optoelectronics and Measurement Techniques Unit (OPEM) at the University of Oulu have invented a new method of

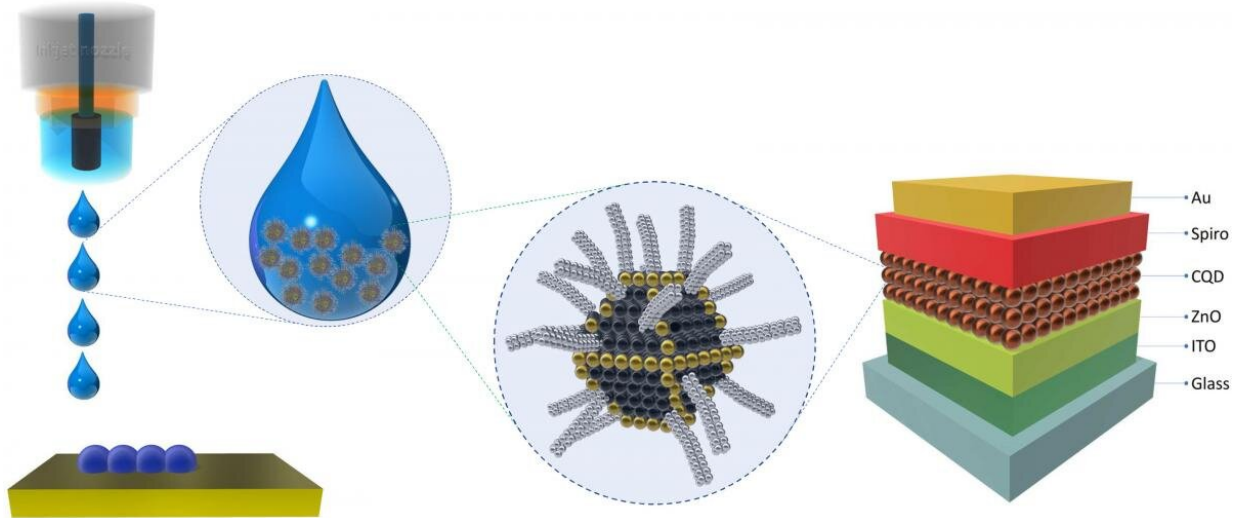
producing ultra-sensitive hyper-spectral photodetectors. At the heart of the discovery are colloidal quantum dots, developed together with the researchers at the University of Toronto, Canada. Quantum dots are tiny particles of 15-150 atoms of semiconducting material that have extraordinary optical and electrical properties due to quantum mechanics phenomena. By controlling the size of the dots, the researchers are able to finetune how they react to different light colors (light wavelengths), especially those invisible for the human eye, namely the infrared spectrum.

Their paper, *Stable Colloidal Quantum Dot Inks Enable Inkjet-Printed High-Sensitivity Infrared Photodetectors*, was published recently in *ACS Nano*.

"Naturally, it is very rewarding that our hard work has been recognized by the international scientific community but at the same time, this report helps us to realize that there is a long journey ahead in incoming years. This publication is especially satisfying because it is the result of collaboration with world-class experts at the University of Toronto, Canada. This international collaboration where we combined the expertise of Toronto's researchers in synthesizing [quantum dots](#) and our expertise in printed intelligence resulted in truly unique devices with astonishing performance," says docent Rafal Sliz, a leading researcher in this project.

Mastered in the OPEM unit, inkjet printing technology makes possible the creation of optoelectronic devices by designing functional inks that are printed on various surfaces, for instance, flexible substrates, clothing or human skin. Inkjet printing combined with colloidal quantum dots allowed the creation of photodetectors of impressive detectivity characteristics. The developed technology is a milestone in the creation of a new type of sub-micron-thick, flexible, and inexpensive IR sensing devices, the next generation of solar cells and other novel photonic

systems.



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"Oulu's engineers and scientists' strong expertise in optoelectronics resulted in many successful Oulu-based companies like Oura, Specim, Focalspec, Spectral Engines, and many more. New optoelectronic technologies, materials, and methods developed by our researchers will help Oulu and Finland to stay at the cutting edge of innovation," says professor Tapio Fabritius, a leader of the OPEM.

The figure briefly introduces the concept of the study conducted by the researchers of the University of Oulu and the University of Toronto. The solution consisting of [colloidal quantum dots](#) is inkjet-printed, creating active photosensitive layer of the photodetector.

More information: Rafal Sliz et al. Stable Colloidal Quantum Dot Inks Enable Inkjet-Printed High-Sensitivity Infrared Photodetectors,

ACS Nano (2019). [DOI: 10.1021/acsnano.9b06125](https://doi.org/10.1021/acsnano.9b06125)

Provided by University of Oulu

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