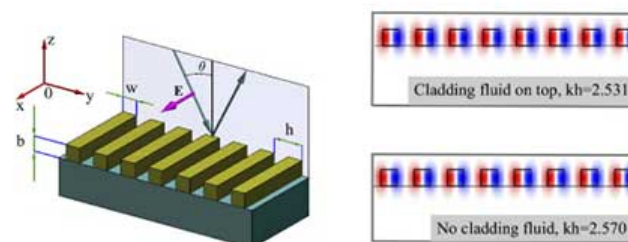


A New Class of Sensitive Optical Sensors

A research team of scientists from the Laboratory of Nonlinear Optics and Spectroscopy of Siberian Federal University and the Krasnoyarsk Research Centre of the SB RAS in collaboration with Dr Sylvia Romano working at the Institute of Applied Sciences and Intelligent Systems (Naples, Italy) have proposed a substantiation of the principles of operation of optical sensors based on bound states in a continuum (BSC). Their work is published in Optics Express, a highly rated international journal.



Over this decade, bound states in a continuum (BSC) has changed from an exotic object and a "mind game" of theorists into a powerful tool that allows controlling the localization of light on nanoscale and focusing light in a small volume of space (from several hundred nanometers to a micron), despite the fact that the system supporting BSC is open to external influences, including the introduction of an external optical signal or the material of the sample under study into the BSC area.

*"Sensitive optical sensors are a promising application of bound states in the continuum. These devices allow detecting the presence of small amounts of specific chemical compounds, as well as biological objects (such as macromolecules, viruses, and bacteria) by measuring the spectral characteristics of the optical signal transmitted through the sensor. In our recent work, we offered, in its essence, the first theoretical substantiation of the principles of operation of optical sensors based on BSC," said **Dmitry Maksimov**, senior researcher at the Laboratory of Nanotechnology, Spectroscopy and Quantum Chemistry of Siberian Federal University.*



The researchers demonstrated that a nanostructured dielectric metasurface in the form of a diffraction grating makes it possible to achieve high characteristics of an optical sensor that responds to changes in the optical properties of a liquid flowing through the sensor with extremely small amounts of test samples.



*"The proposed approach enables us to theoretically calculate the sensitivity of sensors based on BSC and, thus, greatly simplifies the use of BSC in metrology and biomedical applications," noted **Valery Gerasimov**, senior researcher at the Laboratory of Nonlinear Optics and Spectroscopy of the Siberian Federal University..*

Sergey Polyutov, the research supervisor of the study, leading researcher at the Laboratory of Nonlinear Optics and Spectroscopy of Siberian Federal University, in turn, emphasized that the work was the first step in a comprehensive research program to create a new class of sensitive optical sensors.



*"In the near future, we are planning to take the next step and carry out a series of experimental studies in order to create a prototype of the new sensitive sensor," concluded **Sergey Polyutov**.*

14 january 2021

© Siberian federal university. Website editorial staff: +7 (391) 246-98-60, info@sfu-kras.ru.

Web page address: <https://news.sfu-kras.ru/node/24096>