# Detecting trace amounts of explosives with light

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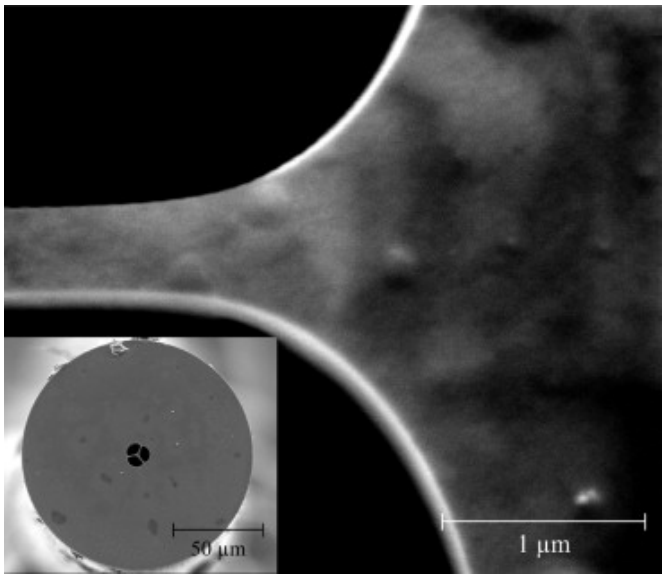


SEM image of the inner walls of a F2 suspended core fiber internally coated with MEH-PPV. The inset shows a wide-angle view of the same fiber. Credit: *Sensors and Actuators B: Chemical*, Volume 199, August 2014, Pages 22-26, ISSN 0925-4005, DOI: 10.1016/j.snb.2014.03.031.

(Phys.org) —University of Adelaide research may help in the fight against terrorism with the creation of a sensor that can detect tiny quantities of explosives with the use of light and special glass fibres.

Published in the journal *Sensors and Actuators B: Chemical*, the researchers describe a novel optical fibre sensor which can detect explosives in concentrations as low as 6.3 ppm (parts per million). It requires an analysis time of only a few minutes.

"Traditionally explosives detection has involved looking for metals that encase them such as in land mines," says project leader Dr Georgios Tsiminis, from the University's Institute for Photonics and Advanced Sensing.

"In today's world, however, homemade improvised explosive devices will often have no metal in them so we need to be able to detect the explosive material itself. This can be difficult as they often don't interact with chemicals and we don't want them near electricity in case they explode."

Instead, the researchers are using a plastic material which emits red light when illuminated with green laser light - and the amount of red light it emits is reduced by the presence of explosives.

Three minute holes at the core of specially manufactured optical fibres are coated with the plastic or polymer material in a thin layer. The explosives sample is drawn up the holes in the fibre by capillary action and the amount of red light emitted measured.

"This has high sensitivity and we can detect tiny quantities of an explosive in a small sample," says Dr Tsiminis, who is an Australian Research Council Super Science Fellow. "And not only do we know if explosives are there, we can quantify the amount of explosive by looking at how the light emission changes over time."

Dr Tsiminis says the sensor is ideal for forensics investigations to determine whether explosives have been present in a particular location. It's inexpensive, quick and easy to use and could be done on site to detect trace amounts of explosive.

"What I like about this technology is that it has a lot of complicated physics underlying it, but it is really a very simple concept," Dr Tsiminis says.

"It also requires very little explosives present so is very sensitive. So forensic investigators would be able to take swabs from various surfaces, place them in some organic solvent and, within a few minutes, know if there have been explosives

present."

The research was done in collaboration with the Defence Science and Technology Organisation.

**More information:** Fenghong Chu, Georgios Tsiminis, Nigel A. Spooner, Tanya M. Monro, "Explosives detection by fluorescence quenching of conjugated polymers in suspended core optical fibers," *Sensors and Actuators B: Chemical*, Volume 199, August 2014, Pages 22-26, ISSN 0925-4005, dx.doi.org/10.1016/j.snb.2014.03.031.