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Glowing report for explosive detection

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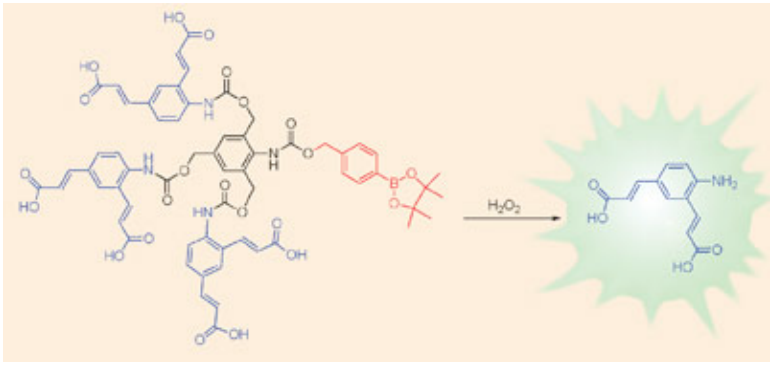
Israeli scientists have developed a sensitive method for detecting TATP - an explosive popular with terrorists. The method detects the explosive directly using dendritic probes and it should be easy to further increase sensitivity, say the chemists.

Triacetone triperoxide, or TATP, is an explosive that has been used by suicide bombers in Israel since the 1980s. It was also employed by the thwarted British 'shoe bomber' Richard Reid on American Airlines flight 63 from Paris, France to Miami, US in December 2001 and is alleged to have been used in the London bombings of July 2005.



The method is sensitive enough to detect tiny amounts of hydrogen peroxide generated by the natural decomposition of the explosive

The explosive's ingredients are common chemicals that are easy to buy without raising suspicion and the material does not contain nitrogen so can pass through many scanners for conventional (nitrogenous) explosives. Detection methods have been developed for TATP in the past, but now Eran Sella and Doron Shabat from Tel-Aviv University have designed a sensitive method that not only detects the explosive without any sample pretreatment, but also very simply amplifies the resulting fluorescent signal.

The method uses a type of dendrimer (a repeatedly branched tree-like polymer) that spontaneously breaks down into its separate building blocks following a single trigger event - a 'self-immolative' dendrimer. The dendrimer was designed to consist of three building blocks that each contain a reporter group which fluoresces at 510 nm upon release from the polymer structure. The trigger for the dendrimer breakdown is hydrogen peroxide, one of the natural decomposition products of the explosive.

Most colour-producing tests for TATP require the explosive to be pretreated with acid, say the scientists, so that it decomposes to produce lots of hydrogen peroxide. But this new method is sensitive enough to detect the tiny amounts of hydrogen peroxide generated by the small degree of natural decomposition of the explosive and, because one molecule of hydrogen peroxide causes each dendrimer to release three fluorescent reporter molecules, a readable detection signal can be obtained for TATP present on the microgram scale.

Simply using higher-generation dendrimers (i.e. more highly branched polymers each containing more fluorescently-tagged building blocks) 'will significantly increase the detection sensitivity', says

Shabat.

'The main challenge', he says, 'will be to selectively identify TATP in the presence of other "powders" that contain oxidative species'.

The scientists say that samples could be collected in real-world environments either by a swab or by vacuum (since TATP has a low vapour pressure it sublimes easily and concentrated gas samples could be analysed).

Freya Mearns

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Self-immolative dendritic probe for direct detection of triacetone triperoxide
Eran Sella and Doron Shabat, *Chem. Commun.*, 2008, 5701
DOI: 10.1039/b814855d

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