Super-sensitive spray-on explosive detector makes great television

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US scientists have designed a new spray-on explosive detector sensitive enough to detect just a billionth of a gram of explosive. After treatment the explosive glows blue under UV light, making it perfect for use in the field – or on CSI: Miami.

William Trogler and his team at the University of California, San Diego, made a silafluorene-fluorene copolymer to identify nitrogen-containing explosives. It is the first of its kind to act as a switchable sensor with picogram (10^{-15}g) detection limits, and is reported in the Royal Society of Chemistry's *Journal of Materials Chemistry*.

Trogler's polymer can detect explosives at much lower levels than existing systems because it detects particles instead of explosive vapours. In the team's new method one can simply spray the polymer solution over the test area, let it dry, and shine UV light on it. Spots of explosive quench the fluorescent polymer and turn blue – this makes it quick and visually exciting enough to be featured on the hit US TV programme CSI: Miami.

The polymer is able to show the difference between nitrate esters, such as trinitroglycerin, and nitroaromatic explosives, such as TNT.

Initially, polymer-treated spots of both compounds appear blue under UV light, but after further exposure the trinitroglycerin spot fluoresces green-yellow whilst the TNT spot remains blue. This colour change is thought to be due to photooxidation of the fluorenyl groups of the

polymer.

Trogler was surprised to find that adding a spirofluorene co-monomer gave the polymer a 100 per cent efficient conversion of UV light into fluorescence, describing this increase as dramatic. 'From a technology perspective, the most surprising thing was the ability to use photochemistry to attain a reasonably chemospecific turn-on sensor,' he says.

The technology is now being commercially produced by RedXDefense, a security company based in the US.

The team are currently working on a similar system to detect peroxide-based explosives and say they hope to be able to investigate perchlorates and organic nitrates too.

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