New device exposes explosive vapors

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Decades after the bullets have stopped flying, wars can leave behind a lingering danger: landmines that maim civilians and render land unusable for agriculture. Minefields are a humanitarian disaster throughout the world, and now researchers in Scotland have designed a new device that could more reliably sense explosives, helping workers to identify and deactivate unexploded mines.

The prototype sensor features a thin film of polymer whose many electrons jump into higher energy levels when exposed to light. If left alone, the electrons would eventually fall back down, re-emitting light. When the 'excited' polymer is exposed to the electron-deficient molecules that are common to many explosives, however, the molecules steal some of the polymer's electrons, and so quench the light emission.

Other devices have used the change in a fluorescent polymer's light-emitting power to detect explosive vapors, but the Scottish team's prototype, described in the AIP's new journal *AIP Advances*, is the first to use a compact silicon-based micro-system to measure the change in the length of time an electron stays in the 'excited' higher energy state.

This measurement is less affected by environmental factors, such as stray light, which should make the device more reliable. It is also an example of how the complementary properties of an organic semiconductor (the polymer) and an inorganic semiconductor (the silicon) can be combined to make novel devices, the researchers write.

The team's current prototype is not yet ready for commercialization, but

future work may soon see it helping to reclaim landmine-littered land.

More information: "Ultra-portable explosives sensor based on a CMOS florescence lifetime analysis micro-system" is published in *AIP Advances*.

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