

APPLICATIONS

Due to the dramatic impact the threat of bombs has on the public and the related media attention, explosives continue to be a favored weapon of terror and destruction. As a trace detector for explosive vapor, Fido has a number of forensic and humanitarian applications, as well as for IED interdiction. Its portability and sensitivity combined with the ability to be integrated with many types of remote vehicles allow Fido to be deployed in ways never before possible. The Fido is currently being used by the US military for explosive detection operations at home and abroad.

PEOPLE AND VEHICLE SCREENING



During the construction and deployment of an explosive device, those involved become contaminated with trace amounts of explosive residue on their skin, clothing and personal effects. In a vehicle, such contamination can be so pervasive that detection can occur even when the explosive device is out of direct sight. The incredible sensitivity of the Fido allows this contamination to be sampled and detected, providing useful evidence and intelligence, even when a terrorist is not caught in the act of building or deploying IEDs.

ENVIRONMENTAL SCREENING



It is estimated that there are tens of millions of anti-personnel landmines deployed around the world as well as millions of acres of land contaminated with explosive ordnance from live fire operations. Current detection techniques are expensive and time-consuming and are complicated due to low metal content as well as external interferents. Utilizing high volume sampling and area reduction techniques, the Fido can provide a highly effective, cost efficient alternative to current screening techniques. The Fido has been successfully tested for such applications with the US military and with demining organizations.

UNDERWATER SCREENING



The Fido has been adapted for underwater explosive sensing applications. The Fido is the first and only product to successfully demonstrate real time detection of a plume of explosives in sea water without the use of preconcentrators. The Fido SeaPup has been integrated with autonomous underwater vehicles for testing and detection purposes.

Fido® Explosives
Detectors
TECHNICAL OVERVIEW

Effective protection from the threat of explosive devices requires a detection solution that is personal and portable. Pinpointing those persons involved in the construction and deployment of an explosive device requires incredible sensitivity. The Fido® explosives detectors provide specific, real time detection of explosives in a truly portable, handheld system with industry-leading sensitivity.



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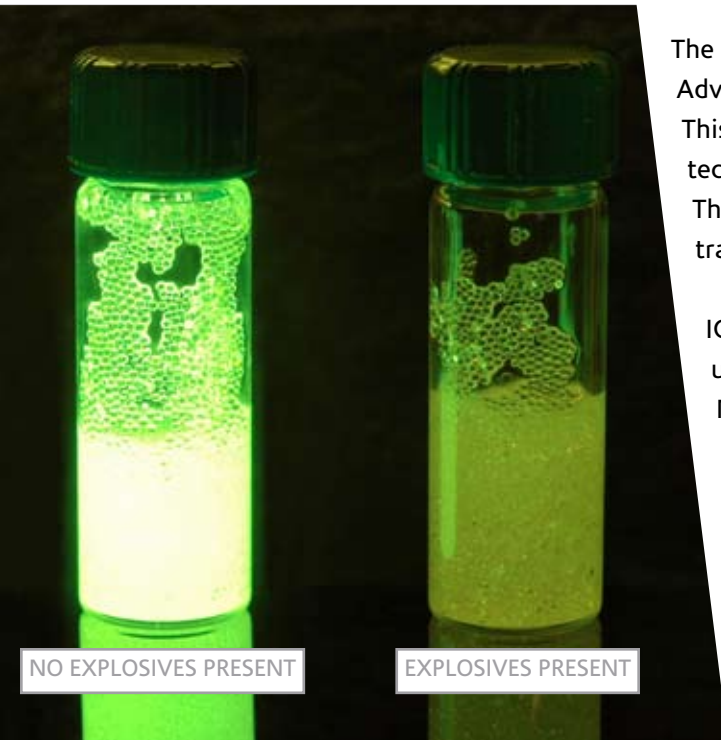
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THE ORIGIN OF FIDO



The development of the Fido began in 1996 as a part of the Defense Advanced Research Projects Agency (DARPA) "Dog's Nose" program. This project was designed to encourage the development of detection technologies that emulate the mine-sensing capabilities of canines. The goal was to find new landmine detection methods for use where traditional metal detectors failed.

ICx Technologies™ met the objective of the project by utilizing a unique chemical sensing material invented by collaborators at the Massachusetts Institute of Technology (MIT). This material was further developed by ICx for use in the Fido and was immediately successful at detecting the minute amount of explosive vapor emanating from buried landmines. The Fido demonstrated canine-comparable performance levels and was the only product in the program to successfully detect buried landmines using vapor detection as a method.

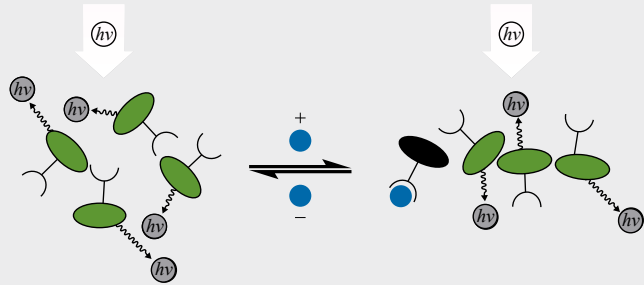
Since the DARPA program, the Fido has evolved significantly and can now detect a range of explosive materials, leading the industry in size and sensitivity.

UNDERLYING TECHNOLOGY

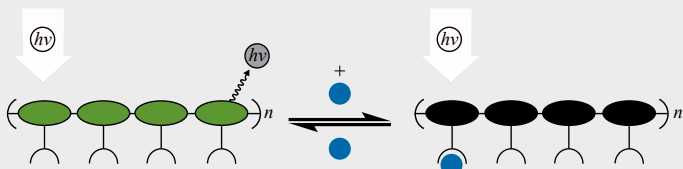
The Fido sensor is based on amplifying fluorescent polymer (AFP), invented by Professor Timothy Swager of MIT. ICx has further developed the material to stand up to the rigors of field use. AFP consists of fluorescing chromophores linked together in polymer chains. When stimulated by light of the correct wavelength, AFP will fluoresce (emit visible light). Explosive molecules will bind to the AFP and reduce (quench) the brightness of the fluorescence. The inherent structure of the chromophore chain in AFP dramatically amplifies the quenching effect, resulting in ultra-low detection limits.

In conventional fluorescence quenching, binding of a single explosive molecule quenches only the chromophore to which the explosive molecule binds. With AFP, binding of a single molecule of explosive quenches the fluorescence of many chromophores. The dramatic amplification of response and resultant sensitivity of the Fido allows the sensor to be used in applications never before possible.

ICx holds an exclusive license to AFP for applications in defense and homeland security.



Traditional Chemosensor (Isolated Chromophores)
Binding of an analyte molecule will only quench the chromophore to which it binds.



Receptors Wired in Series (Molecular Wire)
A single molecular binding event quenches the fluorescence of many chromophores, thereby amplifying the chemosensory response by orders of magnitude.

- Emissive Polymer
- Quenched Polymer
- Analyte Molecule
- $h\nu$ Light at excitation wavelength
- $h\nu$ Light at emission wavelength

SELECTIVITY & SENSITIVITY

AFP exhibits a high degree of selectivity based on electrostatic properties. This results in the preferential binding of target analyte molecules to receptor sites on the AFP. Selectivity is enhanced due to oxidation-reduction properties of the AFP and quencher. This selectivity contributes to the mitigation of false alarms.

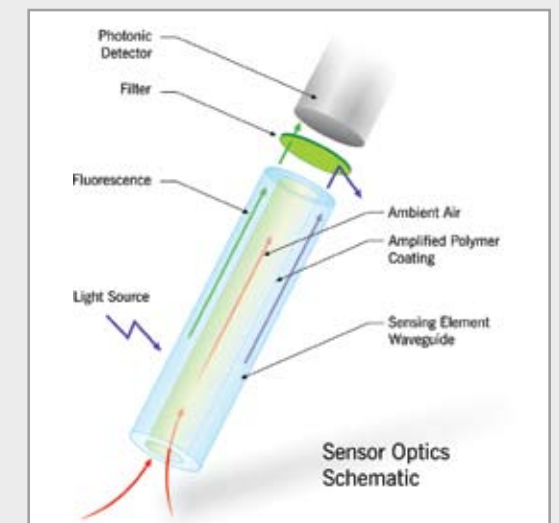
AFP was originally developed to detect nitroaromatic explosives such as TNT. In laboratory tests, the Fido sensor has demonstrated a lower detection limit of 1 femtogram (parts per quadrillion) of TNT. Further advancements have led to the detection of explosive compounds such as RDX, PETN, NG and others.

In side-by-side field tests, Fido has shown detection performance comparable to that of highly trained canines – historically the best real time explosive vapor detection method.

DESIGN OVERVIEW

As described, AFP is the active sensing material that indicates the presence of explosive vapor in ambient air. In the Fido systems, AFP is coated inside the bore of a glass capillary, called a Sensing Element, which is then inserted into the detector. During system operation, a light source stimulates the AFP, causing it to fluoresce. Simultaneously, ambient air is pulled through the bore of the Sensing Element. Traces of explosive vapor in the air-stream will adsorb to the AFP and attenuate its characteristic fluorescence. This change is detected using optical and electronic components designed to maximize sensitivity.

When a target analyte passes through the Sensing Element, the fluorescence quenches and the optoelectronics convey the event through the user interface. The response is reversible, so a single Sensing Element may be used to sample numerous targets throughout its lifespan.



FIDO SYSTEMS

The Fido technology has been designed for ease of operation and is suitable for handheld, bench-top and robot-mounted applications. In any configuration, the Fido maintains its lightweight, compact design for a variety of detection scenarios.



Fido XT



Fido PaxPoint



Fido FastGate



Fido OnBoard