New Technologies

Quantum Fingerprint™ Sensor

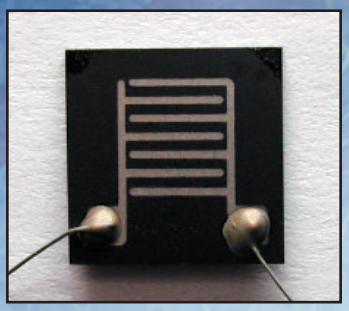

Figure 1: Prototype QF™ sensor on polycrystalline tool-grade diamond film.

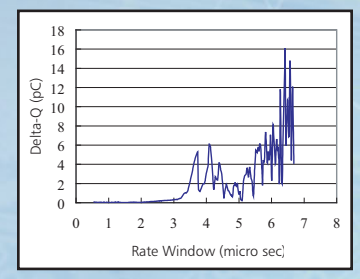

Figure 2: Preliminary QF™ spectrum of Crystal Methamphetamine on diamond.

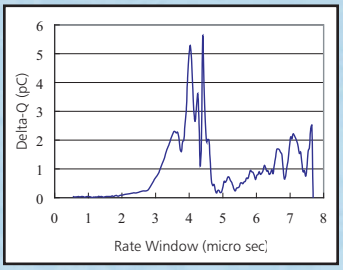

Figure 3: Preliminary QF™ spectrum of TNT on diamond.

U.S. Semiconductor Corporation has acquired a new and extremely novel, cutting-edge, sensor technology called the Quantum Fingerprint™ (QF™). This new technology is based upon measuring the unique quantum energy states of charge-trapping centers created in semi-conductor materials when gaseous molecules adhere to the surface via van der Waals forces. This technology enables extremely high sensitivity and selectivity when detecting in gaseous environments and will be capable of addressing the critical need to protect civilian and military assets against potential releases of numerous chemical and/or biological (C/B) agents. Other possible applications include detection of explosives and IEDs, border security, food supply security, sanitation engineering, chemical process monitoring, environmental monitoring, medical monitoring, and infectious disease detection and tracking in humans, plants, and livestock. US-Semi will be pleased to discuss terms for the release of this technology for commercial production. Demonstration of this technology will be available.

Sensors based on other existing technologies are generally sensitive down to only about 1 part per billion [ppb] and must be dedicated to, at most, one or two substances in well characterized environments because of fundamental limitations in their sensitivities and abilities to selectively discriminate. Even those that can be made more sensitive are usually prone to becoming very expensive beyond this ppb level of sensitivity. Additionally, many other existing detection technologies must use collectors and/or concentrators via intermediate stages and thus, are not true gas-phase or even real-time detectors and many existing sensors cannot be used for C/B agents. The QF™ technology, properly adapted to specific target agents of interest, has the capability of sensing the agents at parts per trillion [ppt] or even parts per quadrillion [ppq] levels in the environment. This enables detection of picogram, femtogram, or perhaps even lesser quantities of material. The lower limit of detection for different gaseous species is not yet fully known and research is underway to determine the ultimate limits for different agents using a variety of detector materials and detector designs in different environments.

The QF™ technology is fundamentally a solid-state technology and hence is both rugged and lightweight and will easily interface with existing computer and communications systems in a highly affordable manner. It is a portable, real-time, user-friendly and very adaptive sensor that can be used to detect virtually any molecular structure — simple, complex, or macro — such as environmental chemicals, chemical agents used as WMDs, lipids, metabolites, and antigens. The QF™ sensors will use wideband gap semiconductor materials to limit thermal noise and the available selection of such materials will allow sensors to be fabricated that will be highly resistant to chemical attack and mechanical wear in a wide variety of different environments.

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