Science and Technology

TRANSPORTATION SECURITY & EXPLOSIVES CHARACTERIZATION

HIGH-VOLUME SAMPLING FRONT-END COLLECTION AND THERMAL EXTRACTION DEVICE

HIGH-VOLUME COLLECTION AND RAPID SAMPLE PREPARATION FOR THERMAL DESORPTION GAS CHROMATOGRAPHY-MASS SPECTROMETRY ANALYSIS

Devices to screen for volatile organic compounds (VOC) are used to check for contraband, environmental hazards, or industrial hygiene. Typically, a surface is swabbed and the sample dissolved in a liquid solvent for testing. This two-step process is time consuming and not suitable in situations where fast screening is needed.

Developed by researchers at the Transportation Security Administration, the High-Volume Sampling Front-End Collection and Thermal Extraction Device (HVST-TED) is a portable, lightweight, and low-cost method for high-throughput testing. Air or surface swab samples are heated to release the sample VOCs, which are pulled through a filter and captured in a commercial thermal desorption tube that can be inserted into any gas chromatography-mass spectrometer (GC-MS) for sample analysis.

KEY BENEFITS

+ Improved detection efficiency
+ Fast sample collection
+ Stationary or portable system
+ Lightweight and low-cost detection method
+ Compatible with third party thermal desorption tubes and GC-MS systems

STAGE OF DEVELOPMENT

Proven System

PARTNERSHIP SOUGHT

License

INVENTORS

Inho Cho

DHS COMPONENT

Transportation Security Administration

The Technology Transfer and Commercialization Branch (T2C) within the Office of Industry Partnerships (OIP) of the Department of Homeland Security (DHS) Science and Technology Directorate (S&T) serves as the centralized point to manage technology transfer activities throughout DHS and the DHS laboratory network. **T2C@hq.dhs.gov**

THE TECHNOLOGY

The high volume sampling front-end component of the HVST-TED consists of a heat cartridge, a primary filter, and a secondary concentrator capable of simultaneously collecting vapor and nano-particle samples. The sampling method is non-contact and non-invasive. A modified high static pressure commercial vacuum system collects the particles and vapors. The device is also equipped with a pre-filter to avoid collecting and mixing unwanted particles, such as dirt, dust, and debris, with the target compounds.

The thermal extraction portion of the device analyzes the collected materials in the HVS front-end component in a Thermal Desorption-Gas Chromatography/Mass Spectrometry (TD-GC/MS) system. The thermal extraction device's heating element heats and extracts the VOCs while the airflow carries the VOCs into a non-proprietary, third-party thermal desorption tube, which is then inserted into a proper TD-GC/MS for sample analysis.

HVST-TED handheld sampling device, charging pack, and sampling traps in a hard case.

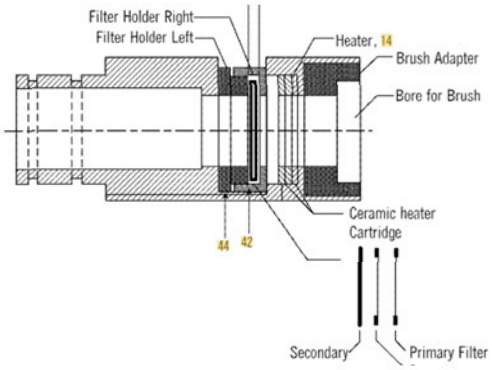

Diagram of the front-end collection system with filter and ceramic heater.

TECHNOLOGY SOLUTION

APPLICATIONS

The technology has several potential use cases:

+ **Transportation security: airports, bus, or train stations**
+ **Immigration and Customs enforcement**
+ **Government building security**
+ **Hazardous material response**
+ **Environmental air monitoring**
+ **Industrial hygiene**

PATENT INFORMATION

US Patent numbers 11,237,083; 11,543,333; and 8,578,796

CONTACT INFORMATION

+ **T2C@hq.dhs.gov**

FOR MORE INFORMATION ABOUT THE DHS TECHNOLOGY TRANSFER & COMMERCIALIZATION BRANCH:

https://www.dhs.gov/science-and-technology/technology-transfer-program