PURDUE INNOVATES | Office of Technology Commercialization

Engineered Polymer Swab for Explosives Residue Detection: A Nanobrush

A highly pliant, thermally stable, and inexpensive Nanobrush device substantially improves security screening by dislodging and capturing trace amounts of explosive materials and biological agents from microscopic cavities.

When inspecting cargo and passengers at airports, security screeners typically employ swab-based methods to capture residual explosive materials that may remain on luggage or clothing handled by anyone that makes bombs. The number of daily screening operations worldwide is more than 10,000. There has been relatively little refinement to the design and fabrication of swabs, nor optimization for interrogating the surfaces of the sampled objects. Current materials include muslin fabric swabs, Teflon-coated fiberglass swabs, paper swabs, and Nomex swabs. These are used primarily for historical reasons, with few attempts to improve their performance at interrogating the surfaces of interest.

Purdue University researchers have developed a new device, Nanobrush, a highly pliant, deformable material that is thermally stable from 200 to 250 degrees Celsius and is inexpensive to produce. It does not leave a residue on surfaces it contacts, and it can dislodge and capture explosive residue from cavities that may be as small as 10 microns wide by 10 microns deep. The functionality of the Nanobrush can be improved by attaching functional groups to the tips of the fibers. This technology will substantially improve the ability to detect trace amounts of explosive materials, biological warfare agents, and other substances of interest to the Department of Homeland Security.

Advantages:

-Dislodges particles from extremely small cavities

-Improves ability to detect trace amounts of substances

Potential Applications:

Technology ID

66280

Category

Aerospace & Defense/Defense Electronics & Surveillance Technologies

Materials Science & Nanotechnology/Nanomaterials & Nanostructures

Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

Authors

Kathryn Balachandran

Stephen Beaudoin

Bryan Boudouris

Michelle Chaffee-Cipich

Aaron Harrison

Stefan Lukow

Lizbeth Rostro

Caitlin Schram

Myles C Thomas

Further information

Parag Vasekar

psvasekar@prf.org

View online

-Airports

-Security screening

-Explosive material detection

TRL: 2

Intellectual Property:

Provisional-Patent, 2013-03-21, United States | Provisional-Patent, 2014-09-18, United States | Utility Patent, 2015-09-18, United States | DIV-Gov. Funding, 2020-06-16, United States

Keywords: Nanobrush, explosive residue detection, security screening, trace detection, highly pliant material, deformable material, thermally stable swab, micro-cavity cleaning, biological warfare agents, Department of Homeland Security technology, Micro & Nanotechnologies, Safety, Security