

Scientists invent real-life 'tricorder' for chemical analysis

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Purdue University researchers have created a handheld sensing system its creators liken to Star Trek's "tricorder" used to analyze the chemical components of alien worlds. But the system could have down-to-earth applications, such as testing foods for dangerous bacterial contaminants including salmonella, which was recently found in a popular brand of peanut butter.

The new portable system is an ultrafast chemical-analysis tool that has numerous promising uses for detecting everything from cancer in the liver to explosives residues on luggage and "biomarkers" in urine that provide an early warning for diseases.

The instrument is a miniature mass spectrometer combined with a technique called desorption electrospray ionization, or DESI. The device and technique were developed by a team of researchers led by R. Graham Cooks, the Henry Bohn Hass Distinguished Professor of Analytical Chemistry in Purdue's College of Science.

"Conventional mass spectrometers analyze samples that are specially prepared and placed in a vacuum chamber," Cooks said. "The key DESI innovation is performing the ionization step in the air or directly on surfaces outside of the mass spectrometer's vacuum chamber."

Unlike conventional mass spectrometers, which are cumbersome laboratory instruments that weigh more than 300 pounds, the new handheld device weighs less than 20 pounds and can be used in the field.



"We like to compare it to the tricorder because it is truly a handheld instrument that yields information about the precise chemical composition of samples in a matter of minutes without harming the samples," Cooks said.

The researchers at Purdue look for compounds that indicate the possible presence of a particular substance, such as cocaine or explosives residues. If these indicators are found, the equipment performs a more indepth analysis to determine the exact chemical structure.

The research team has used the device to analyze clothes, foods and tablets, and to identify cocaine on \$50 bills in less than 1 second.

Two startup companies have been established on the basis of DESI and the portable mass spectrometer: Prosolia Inc. in Indianapolis, has commercialized the DESI source, and Griffin Analytical Technologies LLC, in West Lafayette, Ind., has commercialized miniature ion trap mass spectrometers.

Source: Purdue University

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