Now, a new laser-based device provides instant analysis of microparticles; gadget promises to change the face of medical diagnosis and terrorist detection

A new detector combines a laser with a mass spectrometer to provide on-the-spot analysis that researchers hope will have applications ranging from evaluating a tumor as it is removed to quickly detecting explosives in luggage.

The laser vapourises tiny samples that can be instantaneously analyzed by the spectrometer and can be used even on living organisms, the team said on Thursday.

"We are talking about less than a second for an analysis," said Alex Vertes, a professor of biochemistry and molecular biology at George Washington University.

Vertes and graduate student Peter Namos say they have used their system to find a drug sample in a drop of sample to detect the chemical changes that accompany colour changes in a living plant leaf and to find explosives residue on a currency note.

The university has interested a patent in the system which Vertes said is the first to use a laser for such instant analysis of living tissue.

Called laser ablation electrospray ionization, or LASEI, it requires a distilled space in a laboratory, but smaller spectrometers and lasers could make it more portable, Vertes said.

The laser forms the living tissue's vapour, vapourizing some of it and sending particles up into the air in a puff. In a process called electrospray ionization, a stream of electrically charged droplets is shot at the spot, ionizing the particles and merging with some of them to make charged droplets.

The mass spectrometer then measures the charged particles, called an ion.

Vertes and Namos say the limiting steps can be shifted from a time required that can be bonded with a fibre-optical cable carrying the laser beam, and a small tube to carry the sample into the spectrometer to be analyzed.

"You can just go into the field and put your laser on the surface you want to analyze," Vertes said.

By taking a series of samples, the detector can analyze off-by-cell changes.

This could help biologists understand a living system, and could help surgeons as well — for example, by analyzing tumours as they are removed.

"You are already cutting the patient, so a little bit of a trick with a laser is not much more," Vertes said. "It is very important to know when the cancerous tissue ends and the healthy tissue begins."

Currently, surgeons send samples to a pathology lab, but this system could save precious minutes, he said.

Vertes is also trying to use it to see stem cells in the process of differentiating, or changing, into the various cell types that they can give rise to. Current methods require scientists to look for one change at a time in each cell sample — destroying the living cells in the process.
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The laser vaporizes tiny samples that can be instantly analysed by the spectrometer, and can be used even on living organisms, the US team said on Thursday.

"We are talking about less than a second for an analysis," said Alex Venzes, a professor of biochemistry and molecular biology at George Washington University.

Venzes and graduate student Peter Nemes say they have used their system to find a drug sample in urine, to detect the chemical changes that accompany colour changes in a living plant leaf and to find explosives residues on a currency note.

The University has filed a patent on the system, which Venzes said is the first to use a laser for such instant analysis of living tissue.

Called laser ablation electrospray ionisation, or LAESI, it requires a desk-sized space in a laboratory, to house the laser and spectrometer, and lasers could make it portable, Venzes said.

The laser burns the living tissue, vaporising it and sending particles up into the air in a puff. In a process called electrospray ionisation, a stream of electrically charged droplets is shot at the spot, interacting with the particles and bringing some of them to make charged droplets.

The mass spectrometer then measures the charged particles, called ions.

Venzes and Nemes say the ionising drops can be shot from a tiny nozzle that can be brought to within a millimetre of a cell, while carrying the laser beam, and a small tube to carry the sample into the spectrometer to be analysed.

You can just go into the field and put your laser on the surface you want to analyse," Venzes said.

By taking a series of samples, the detector can analyse cell-by-cell changes.

This could help doctors understand a living system, and could help surgeons as well, for example, by analysing tumours as they are removed.

"You are already cutting the patient, so a little bit of a prick with a laser is not much more," Venzes said. "It is very important to know when the cancerous tissue ends and the healthy tissue begins."

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So far the system works best on tissue from a live cell sample, but he hopes it will work on frozen samples as well.

"The technology is not ready yet," he said. "But it is not too far away."

MUMBAI MIRROR

ANALYSE THIS

"Green" sea-robot that propels itself

A research vessel that uses heat energy from the ocean to propel itself is the first "green" Rubin and the first to use a mass spectrometer for analysis of living tissue.

The vessel, called the LAESI DR, is a small boat with a laser beam at its front end that can vaporise tiny pieces of tissue from a living cell, allowing the researchers to see what is happening inside the cell.

Such robots can carry sensors to measure temperature, salinity and biological productivity. They usually surface from the water, where their position is tracked using GPS and to communicate via satellite to a laboratory.

Most gliders rely on battery-powered motors and magnetic field sensors, but this "green" robot uses heat energy to propel itself and to communicate with a satellite.

Such robots can carry sensors to measure temperature, salinity and biological productivity. They usually surface from the water, where their position is tracked using GPS and to communicate via satellite to a laboratory.

The thermal glider, however, draws its energy from the difference in temperature between warm surface waters and the cold, deeper layers of the ocean. The ship uses this difference in temperature to propel itself and to communicate with a satellite.

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