Volume 3, Number 41 - March 8, 2002

Liquid-coated Fluids For Smart Drugs, Food

A new method for coating a liquid with another liquid may lead to everything from interactive "smart" beverages to ultrasound-activated cellular surgery, microscopic computers and space propulsion in future.

These novel liquid capsules from Ignacio Loscertales at the University of Malaga and Antonio Barrero of the University of Seville in Spain can have wildly varied properties depending on the dosage levels of their molecular ingredients -- anything from flavors and aromas to medicine.

"Imagine that you and I buy exactly the same beverage, but you want to have one today that is red and tastes like cherry and I decide that I want green and lemon," explained co-researcher Manuel Marquez, a physical organic chemist at the Nanotechnology Lab of Kraft Foods in Glenview, Ill. "If you have cherry flavor and a red color in a capsule that can be activated by a specific frequency, you can personalize your interactive beverage."

The surface layers of these drops can be hardened by ultraviolet light, heat or a wide range of other methods, the researchers reported in the journal Science. These solidified capsules may then be popped via ultrasound or microwaves, with different capsules designed to break only at specific frequencies.

"We have never done this before in the past because we didn't have full control of the properties of the shells," Marquez told United Press International. "Now we can start to dream of having hundreds and hundreds of nanocapsules and breaking only the one you want."

The novel technique uses an electrified spray to mix fluids into droplets smaller in diameter than wavelengths of light, encapsulating liquids within liquids in globules only nanometers or billionths of a meter wide.

"To get into the bloodstream, (the capsules) have to be a very, very tiny size, below 500 nanometers," Loscertales explained.

One of the most obvious potential applications is cellular surgery. Medical scientists can enclose vital drugs in coatings studded with chemicals that bind only to the surfaces of particular cells, such as those in tumors or in the heart. Once the capsules have latched onto their targets, physicians could then trigger the delivery of these medicines wirelessly.

Loscertales said his team also is working with researchers at Yale University in New Haven, Conn., for a new form of space propulsion for small satellites.

"New thrusters may atomize liquid electrically and accelerate these charged particles to throw them into the vacuum," Loscertales explained. "We're using this technology to cover water in oil so it will prevent

evaporation in space."

Scientists can carefully control the amount of fluid in each layer simply by adjusting the voltage of the aerosol spray.

They can also potentially produce droplets made of at least five shells, a level of precision useful for highly specific drugs or industrial applications.

The researchers are consulting with scientists at the National Institute of Standards and Technology in Gaithersburg, Md., for potential applications in molecular circuitry. The electrified spray may be able to spin multilayered wires and fiber optics only nanometers wide for handheld supercomputers. A wire is, after all, only a stretched-out drop, Marquez explained.

"It's an excellent innovation," said chemical engineer Gus Larsen at the University of Nebraska at Lincoln. "If you can make a set of concentric tubes in a hollow nanofiber, then the amount of surface area you have increases dramatically ... in applications such as production of chemicals in industrial engineering."

--

--

aboutus | contact us | subscribe