Versatile coating for biomedical devices lets them interact with live cells

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A new type of plastic coating made from vapor could lead to better biomedical devices such as stents and catheters that are "bioactive," meaning they can interact with the living cells around them in unique ways.

The coating binds to a broad range of materials including glass, stainless steel, Teflon and silicon. More like a paint than a blanket, it is able to preserve the precise shape of the device it covers. The outer surface of the coating can be made to attract or repel certain molecules such as platelets or proteins.

"These are fundamental advantages to our system when we compare it to other coatings already in use," said Joerg Lahann, the Dow Corning Assistant Professor of Chemical Engineering. "We recognized that the biomedical devices have to be bioactive. You need to have biological signatures that can actively mitigate the response of the body to the implant.

"In order to do that, you need to be able to bring biomolecules onto a substrate surface and immobilize them in a stable way. Think of these biomolecules as little anchors. Depending on what you choose as your anchors, you can produce a certain response."

Stents that prop open arteries for heart patients don't always repel platelets very effectively, which could, in a worst case scenario, lead to a blood clot. Catheters—tubes that drain fluid from the body—are often

used temporarily after surgery. Doctors don't want proteins to bind to the catheter or the tube, in a sense, starts to grow into the body. This new coating can help prevent proteins from binding to the catheter, Lahann said.

These applications call for the coating to be non-stick for proteins or cells. With different biomolecules dotted through the coating, it could act as a sensor, attracting certain molecules to bind to it.

The engineers create this coating basically by heating up its components in a furnace and then letting the vapors cool on the substrate, which is the material the biomedical device would be made of. These coating are often only tens of nanometers thick. A nanometer is one-billionth of a meter.

Lahann will present this research at the American Chemical Society meeting on April 6. The presentation is called: "Spatially controlled engineering of biointerfaces via functionalized poly-p-xylylenes."

Lahann is also an assistant professor in the departments of Materials Science and Engineering, Biomedical Engineering, and Macromolecular Science and Engineering.

Source: University of Michigan

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