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chnology - Posted by Steve McGaughey-Illinois on Monday, March 1, 2010 11:46 - 1 Comment **Email This Post** **Print This**

lk the secret to better biomonitors?

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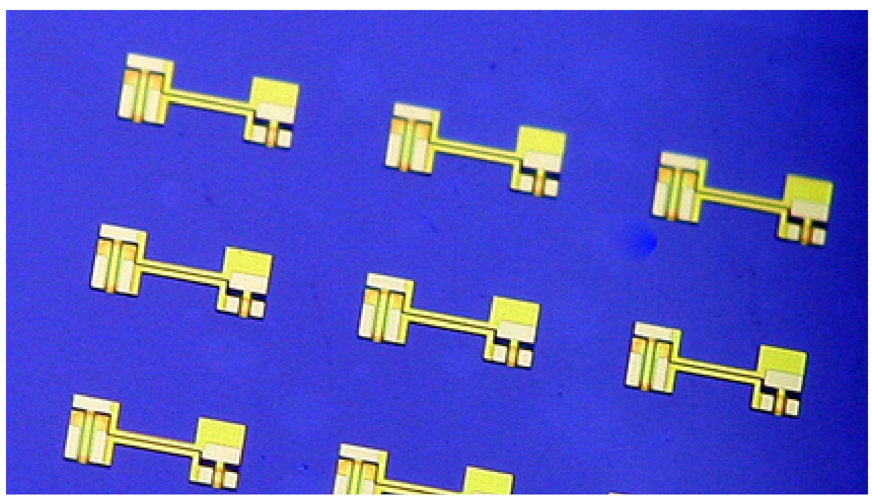
tability, bioelectronics, biomedical engineering, biosensors, materials science, nanomembranes, silicon, silk, University of Illinois



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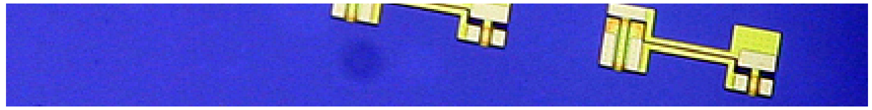

Developing biological electronics that can be integrated safely into the body for use as medical aids are some of the most exciting—and challenging—prospects facing biomedical researchers. A team at Tufts and the University of Illinois are working to develop silicon-on-silk electronics that are almost completely biodegradable and conform to biological tissue. (Courtesy: U. Illinois)

U. ILLINOIS (US)—Futuristic medical devices—such as an “electronic tattoo” that monitors blood sugar levels—have entered the realm of the possible with the creation of silicon-on-silk electronics.

Researchers at Tufts University worked with University of Illinois researcher John Rogers to help develop silicon-on-silk electronics that are almost completely biodegradable and conform to biological tissue.

The small size of the thin silicon circuits avoids adverse biological reactions while the silk conforms to tissue and dissolves harmlessly over time, factors that make the technology ideal for safely integrating biomedical devices into the human body.

Monitors are not the only potential integrative application. The technology could be used to create electrodes for brain-machine interfaces such as prostheses.

Rogers, a researcher at Illinois’s Beckman Institute, and his collaborators describe the work in a paper that appeared in *Applied Physics Letters*.

In their paper, the authors speak to the challenge to develop electronics that can be integrated safely into the body for use as medical aids, writing: “An approach that avoids some of the longer term challenges in biocompatibility involves a construction in which some parts or all of the system resorbs in the body over time.”

The researchers report that the paper outlines strategies for “integrating single crystalline silicon electronics, where the silicon is in the form of nanomembranes, onto water soluble and biocompatible silk substrates,” they add. “Electrical, bending, water dissolution, and animal toxicity studies suggest that this approach might provide many opportunities for future biomedical devices and clinical applications.”

The challenge for these types of devices is achieving biocompatibility due to the complexity of the body’s responses to many organic and inorganic materials. By avoiding the use of rigid silicon electronics or packaging materials that may not be biocompatible, silicon-on-silk electronics open up development of entirely new types of biomedical applications.

The researchers conclude that silk is preferable to other biodegradable polymers such as polyglycolic acid or collagen, because of “its robust mechanical properties, the ability to tailor the dissolution, and/or biodegradation rates from hours to years, the formation of noninflammatory amino acid degradation products, and the option to prepare the materials at ambient conditions to preserve sensitive electronic functions.

"This approach has the advantage that it does not require the development of an entire set of biogradable electronic materials, but still yields an overall system that dissipates bulk material features at a rate suitable for the application."

University of Illinois news: www.beckman.illinois.edu/index.aspx

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