

stantially reacted to form epoxy resin as they were deposited, either as alternating single layers or as alternating stacks of five layers each. A single printed layer of 5% solution results in a film thickness of about 25 μm , which becomes a liquid-epoxy film of $\sim 1 \mu\text{m}$ once the water is lost.

As the researchers pointed out, the self-assembly approach can be applied to combinations of ceramic powders, modified with ionic dispersants, and ionic polymers.

Current ink-jet printing offers a lateral resolution of about 25 μm and a thickness of about 1 μm .

SHIMING WU

Fabricated Joint Cartilage Mimics Structure and Function of Tissue

Bioengineers at the University of California—San Diego (UCSD), in a collaboration with scientists at Rush Medical College in Chicago, have fabricated cartilage tissue that mimics certain features of the multilayered structure and cellular functions of natural articular cartilage. "We've designed a tissue made up of different types of cartilage cells with the notion that this type of tissue could be implanted into a patient and be grown to conform to the specific geometry of the

individual's joint," said Robert Sah, professor of bioengineering at the UCSD Jacobs School of Engineering, referring to the research conducted with Koichi Masuda and Eugene Thonar at Rush.

In previous work, the research team found that cartilage is soft at the surface, but 25 times stiffer in the deep regions, and that the cells in the surface region make a key protein called superficial zone protein, which is a major lubricant of joints. Using this data, the bioengineers developed a strategy to organize different types of chondrocytes in a cartilage construct, mimicking the stratified nature of normal cartilage tissue. As graduate student Travis Klein described at the Biomedical Engineering Society's annual meeting in October, the research team fabricated this construct using a method in which the cells are suspended in a gel until they surround themselves with normal cartilage-matrix components. The gel is then removed, leaving an entirely biological tissue.

In laboratory tests, the researchers found that the cells at the surface of their engineered tissue effectively secreted superficial zone protein. In addition, the cells used to form the cartilage surface made tissue that was soft and had a less

dense matrix than that formed by cells in the deeper regions.

The researchers described the engineered tissue as "immature cartilage," such as that found during fetal development, in which the cartilage cells are organized in a stratified fashion and densely packed, and the matrix is loosely knit. The researchers expect this will give the implant an advantage because as it continues to mature, it is likely to integrate well and conform to fit with the surrounding cartilage and joint tissue.

Palladium Mesowire Array Sensor Detects Hydrogen Gas

Chemists at the University of California—Irvine (UCI) have built a nanoscale hydrogen sensor that can be used to detect dangerous levels of the explosive gas in devices such as fuel cells and internal-combustion engines. The sensors were found to respond faster and be more selective for hydrogen than conventional sensors, while needing significantly less power for operation. In building this sensor, Reginald M. Penner, UCI professor of chemistry, and his team created nanowires using a method called step-edge decoration. In this method, palladium ions

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