Novel Polymer Hybrid Improves Stability of Implantable Devices (#8449)

For use in intervertebral disc replacement therapies

This polymer-based hybrid material improves the stability of dynamic implantable devices, such as artificial intervertebral discs (IVD) and other fibrocartilage replacements. The multi-construct combination aerogel and hydrogel material is composed of polyvinyl alcohol (PVA), a water-soluble synthetic polymer that uses no additional chemicals for crosslinking. It can be generated in solids, hydrogels, and foams for use in disc replacements.

When used as an IVD, aerogel surrounds a hydrogel component core produced through a freeze-thawing methodology. In this application, the stiffness of the aerogel combines with the hydrogel's elastic response to produce a device that permits dynamic rotational and compressive movement. The size and shape of the device and its aerogel/hydrogel components are modified with custom molds, and nanomaterials can be added for further customization.

This Georgia Tech innovation will contribute to the development of devices that can effectively handle physiological loads and adhere firmly to surrounding tissue.

Benefits/Advantages

- **Strong**: Provides structural stability and enhanced cellular adhesion for implant materials
- **Biocompatible**: Reduces the risk for complications that could arise with the use of chemical components
- **Customizable**: Permits easy incorporation of various nanomaterials to fine-tune devices to meet patient needs

Potential Commercial Applications

- Biological
    - Artificial IVDs
    - Fibrocartilage replacements
- Non-Biological
    - Packaging for wet/moist components
    - Controlled release of chemicals in solution

Background/Context for This Invention

Nearly 75 percent of back pain is attributed to degenerated or damaged spinal discs. Surgical spinal fusion is a common remedy but can limit patient range of motion. Artificial IVDs are a growing technology designed to treat damaged discs as they provide greater comfort and flexibility. Consisting of a fibrous set of rings encircling a gel-like center, they permit dynamic rotational and compressive movement.

Georgia Tech's PVA-based polymer material is easily processed into a variety of constructs with no need for additional chemicals. Designed for use as an artificial IVD, it can be used for other fibrocartilage replacements and also offers potential for applications that require a modifiable compressive use.

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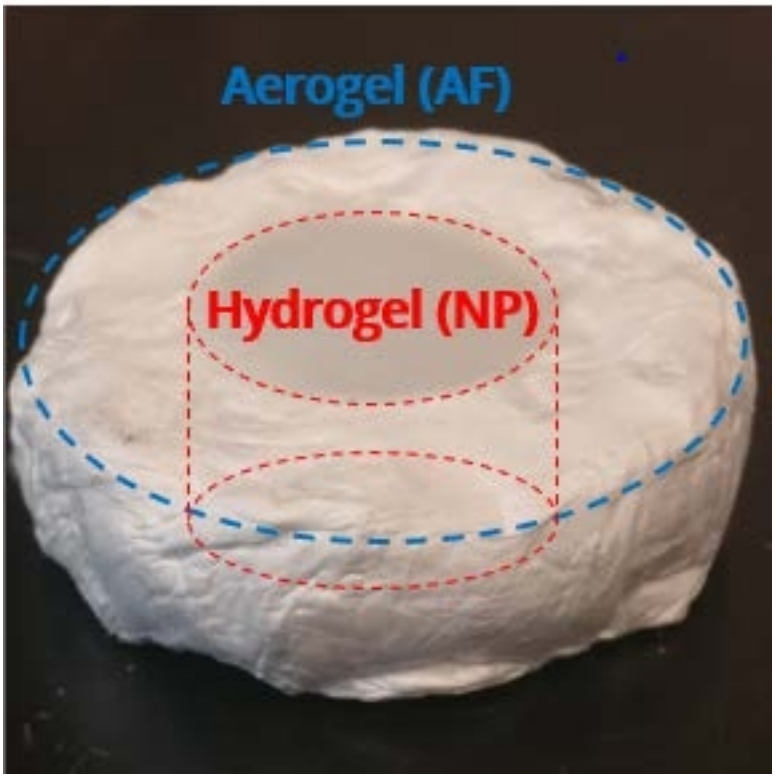
More Information

Publications

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/novel-polymer-hybrid-improves-stability-implantable-devices

Images:



Example of an artificial intervertebral disc: Georgia Tech’s PVA aerogel surrounds hydrogel