Injection Molding of Biodegradable Tissue Engineering Scaffolds

View U.S. Patent No. 7,998,380 in PDF format.

WARF: P07200US

Inventors: Lih-Sheng Turng, Adam Kramschuster

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a simple and inexpensive method of mass producing biodegradable structures for tissue engineering and drug delivery applications.

Overview

Biodegradable scaffolds with highly interconnected pores are potentially useful in tissue engineering. A rigid, highly porous platform could be used to guide growth in tissues such as bone, cartilage and nerves. This platform would gradually be absorbed into the body as natural tissue replaces it. Such scaffolds could also serve as implantable drug delivery vessels.

However, current means of producing these structures use organic solvents, which could render them unusable, or are not amenable to mass production. One option is injection molding, which is commonly used to mass produce plastic parts, but the level of porosity that can be achieved with that technique is far below what is required for tissue scaffolds.

The Invention

UW-Madison researchers have developed a simple and inexpensive method of mass producing biodegradable structures for tissue engineering and drug delivery applications. The method starts with a composite blend of a salt, a water-soluble polymer and a biodegradable polymer. A foaming agent and/or supercritical fluid may be added to the composite, which is injected into a mold to form components with complex geometries. After molding, the salt and water-soluble polymer are removed to result in a low density, biodegradable structure.

Applications

- Wound closure
- Orthopedic fixation devices
- Other dental, cardiovascular, intestinal and drug delivery applications

Key Benefits

- Provides—for the first time—a method of mass producing highly porous, biodegradable polymer scaffolds with complex geometry
- Salt provides up to 60 percent porosity.
- Microcellular injection molding process creates additional porosity while reducing the viscosity of the highly filled composite used for injection molding.
- Pore size can be controlled.
- Water-soluble polymer provides a network by which the pores are connected.
- High connectivity between pores fosters biocompatibility.
- Method uses low processing temperatures, resulting in low thermal degradation.
- Does not use organic solvents

Tech Fields

- Medical Devices : Other medical devices

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867