Biodegradable hydrogel with highly tunable material properties

Technology #2019-330

A method to create hydrogels comprising crosslinked methylcellulose with highly tunable, temperature responsive properties.

Chemically cross-linked methylcellulose

Methylcellulose is a widely used rheology modifier that is used to reversibly alter the viscosity of consumer products such as pastes, oral tablets, etc. When a methylcellulose solution is heated above its sol-gel transition temperature, the viscosity of solution increases as physical gelation occurs. This transition temperature is typically around 50 °C, and the gelation process is reversible. Researchers at the University of Minnesota have recently developed a method to create chemically cross-linked methylcellulose hydrogels with tunable temperature dependent properties.

Introduction of allyl groups on the polymer backbone enables chemical crosslinking of cellulose polymers. Depending on the crosslinking temperature, polymer and salt concentration, hydrogels display highly tunable temperature dependent physical properties that are unique and attractive.

Tunable material properties

- Hydrogel can be formed at any temperature between 20°C and 85°C.

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Hydrogel conversion can be reversible or irreversible.
Hydrogels can remain solid at room temperature in the presence of water.
Adjustable opacity, viscosity, and volume change with temperature.
Polymers can be crosslinked either chemically, using photoinitiator and UV-light
Extent of backbone allylation can be controlled (< 1% up to 50%).
Highly tunable temperature dependence of elastic modulus (1-5000 Pa).

Phase of Development
Proof of concept. Hydrogel synthesized and characterized on laboratory scale.

Features & Benefits
- High degree of tunability
- Methylcellulose and other cellulose ethers are commercially available and Generally Recognized As Safe (GRAS) additives in common use throughout the world
- Multiple ways to tune material properties
- Biodegradable hydrogel

Applications
- Food and pharmaceutical additives
- Consumer products such as cosmetics
- Rheology modifier

Ready for Licensing
This technology is now available for license! The University is excited to partner with industry to see this innovation reach its potential. Please contact Larry Micek to share your business’ needs and your licensing interests in this technology. The license is for the sale, manufacture or use of products claimed by the patents.

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