CHEMTECH LIFE SCIENCE

TECHNOLOGY OFFER

NOVEL HYDROGEL PRECURSORS OPENING UNPRECEDENTED PROCESSING AVENUES IN THE BIOMEDICAL FIELD

We are seeking partners interested to explore our highly reactive novel hydrogel precursors with a unique set of properties, allowing a breakthrough in processing ease.

INTRODUCTION

Hydrogels are a popular class of biomaterials consisting of three-dimensional networks composed of crosslinked water-soluble synthetic and natural polymers. The intriguing ability of hydrogels to contain large amounts of water makes them perfect to mimic the natural extra-cellular matrix (ECM) and therefore they are currently used in multiple biomedical applications.

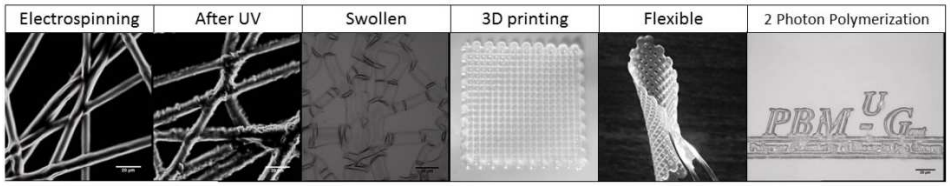
The final shape of the hydrogel is highly important for many applications; however hydrogels are notoriously hard to process. Processing possibilities include **film casting, 3D-printing, electrospinning, electro-spraying** and **2-photon polymerization**. Current hydrogel precursors can only be UV-crosslinked in solution or in the molten state, which is highly challenging. Hence, there is a clear need for hydrogels that are easy to process, leading to accurate and reproducible final shapes.

TECHNOLOGY

Researchers at Ghent University in the Research group of Prof. P. Dubruel in collaboration with Allnex, a leading supplier of specialty chemicals, have developed a series of **novel urethane-based hydrogel precursors.** These precursors have the unique properties of being able to be crosslinked (UV-cured) in the solid state (in the absence of solvent), allowing to accurately pre-shape the material via solidification trough several processing techniques, prior to hydrogel formation. Moreover, highly biocompatible materials are obtained because the covalent crosslinking of the precursors can occur without addition of photo-initiators.

Our proprietary precursors are based on the following building blocks:

Depending on the application, different compositions can be selected to fine-tune the desired properties of the precursors and the resulting crosslinked networks. Flexible crosslinked networks can be obtained with tunable properties such as, hydrophillic/hydrophobic balance, thermal- and mechanical properties, crosslink densities, mesh size, porosity etc. The required properties of precursors and crosslinked materials greatly depend on the envisaged application and the processing method.



APPLICATIONS

Our versatile hydrogel precursors can be specifically used in multiple biomedical applications, including **contact lenses**, **wound dressings**, **tissue engineering** materials, **delivery systems** for bioactive components or as biocompatible coating on implants or other materials. Hydrogel development might primary feed into a series of biomedical soft tissue applications with challenging processing constraints.
The novel urethane based precursors can be easily processed via moulding, 3D-printing, electrospinning, or electrospraying, prior to cross-linking. Microstructures can be created in the solid state using 2-photon-polymerization.

ADVANTAGES

- Precursors are produced on kg scale via one-pot, two-step solvent free synthesis
- Hydrogels start from water soluble macro-monomers or precursors
- Interestingly, covalent crosslinking occurs without addition of any photo-initiator
- No need for removal of toxic photo-initiator
- Precursors are highly water compatible and extremely water soluble, allowing high starting concentrations (beneficial in e.g. electrospinning)
- Precursors are semi-crystalline solids at room temperature (RT)
- For e.g. in 3D-printing and electrospinning: precursors can be processed in the melt (T_m ~ 40°C) and are solid at RT.
- Most strikingly, the precursor can be crosslinked (UV-cured) in the solid state, allowing to accurately pre-shape the material via several processing techniques, prior to hydrogel formation.

STATUS OF DEVELOPMENT

A series of precursors have been synthesized and fully characterized. Initial processing experiments were set up including film casting, 3D-printing, electrospinning, and 2-photon polymerization. The precursors and cross-linked materials were characterized and evaluated in *in vitro* biocompatibility assays.

PARTNERSHIP

Ghent University is seeking partners for further evaluation of our tailor made precursors suitable for your application. We can provide you with test material or we can co-develop novel material with specific product requirements for biomedical applications and beyond.

INTELLECTUAL PROPERTY

A European patent application was filed as priority application.

CONTACT

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