HYDROPHILIC GELS FROM POLYURETHANE-BASED PHOTOINITIATORS

FIELD OF THE INVENTION

The present invention relates to polymeric photoinitiators based on polyalkyletherurethane backbones and their use in the production of gels. The invention relates to methods for manufacturing hydrophilic gels using said polymeric photoinitiators, and the gels thus obtained.

BACKGROUND OF THE INVENTION

Curing of coatings through ultraviolet (UV) radiation, thereby resulting in a coating for use as a gel (e.g. a hydrogel), requires efficient methods of initiating the chemical reaction responsible for the curing process. Cross-linking of polymeric material through generation of radical species upon irradiation with UV light is widely used to produce hydrogels for medical device coatings. Coating compositions with polyvinylpyrrolidone and a photoinitiator as the main constituents, which are cured with UV irradiation, are often used for producing hydrogels. The photoinitiators used in these processes can be either oligomeric or polymeric. Oligomeric photoinitiators are partially free to diffuse to the surface of the cured material, thereby rendering these substances exposed to the environment.

Polymeric photoinitiators are disclosed in EP 0 849 300, WO 2008/012325 and Wei et al. Polymers for Advanced Technologies, 2008, vol.18, no. 12, p.1763-1770.

OBJECT OF THE INVENTION

The object of the present invention is to provide a method for the manufacture of gels, as well as the gels which result from these methods.

SUMMARY ~~OF THE INVENTION~~

It has been found by the present inventors that certain polymeric photoinitiators can be used in the formation of gels.

In a broad embodiment~~aspect~~, therefore, the present disclosure~~invention~~ relates to a method for the manufacture of a gel, said method comprising the steps of

In an aspect, there is provided a method for the manufacture of a gel, said method comprising the steps of

a. providing a matrix composition comprising a polymeric photoinitiator synthesized using:

(4-(3-(bis(2-hydroxyethyl)amino)propoxy)phenyl)(phenyl)methanone, PEG2000, and 4,4'-methylenebis(cyclohexyl-isocyanate);

b. curing the matrix composition obtained in step a. by exposing it to UV radiation, and

c. exposing the matrix composition to a swelling medium, thus providing a gel

wherein step c. may take place before or after step b.

In other aspects, t~~T~~he present disclosure~~invention~~ also provides a gel, particularly a hydrophilic gel, obtainable via the method as disclosed herein~~of the invention~~, and a medical device comprising the gel as disclosed herein~~of the invention~~.

In the case where the swelling medium is water, a hydrogel is obtained.

LEGENDS TO THE FIGURE

Fig. 1 illustrates a general motif of polymeric photoinitiators, with photoinitiator moieties pendant on a polymeric backbone.

Figs. 2-8 display the change in mechanical properties when a sample of pristine photoinitiator is exposed to UV light at 120 °C for various polyurethanes of the Examples. At time t=0 irradiation with UV light is started and an instant increase in both the loss and storage modules takes place. When the moduli are equal, a transition from liquid to solid proceeds by further UV radiation. If the sample is exposed to water after this curing step, a hydrogel material is obtained.

Fig. 9 illustrates the processes of the invention.

DETAILED DISCLOSURE OF THE INVENTION

Definitions

"Optionally-substituted" means optionally-substituted with one or more substituents selected from the group consisting of C1-C25 linear, branched or cyclic alkyl, aryl, -OH, -CN, halogens, amines, amides, alcohols, ethers, thioethers, sulfones and derivatives thereof, sulfonic acid and derivatives thereof, sulfoxides and derivatives thereof, carbonates, isocyanates, nitrates, acrylates. Preferably, the one or more substituents are selected from the group consisting of -OH, -CN, halogens, amines, amides, alcohols, ethers, thioethers, sulfones and derivatives thereof, sulfonic acid and derivatives thereof, sulfoxides and derivatives thereof, carbonates, isocyanates, nitrates, acrylates. Most preferably, the substituent is selected from the group consisting of -OH, -CN, halogens, amines, amides, alcohols, ethers, thioethers, sulfones and derivatives thereof, sulfonic acid and derivatives thereof, and sulfoxides and derivatives thereof.

Hydrophilic