Claims

1. A polyurethane polymer composition prepared by reacting a mixture comprising:

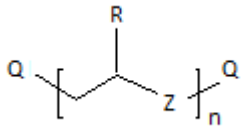
at least one poly(ethylene glycol) compound,

at least one block copolymer having the general structure poly(ethylene glycol)-poly(propylene glycol)-poly(ethylene glycol) or poly(propylene glycol)-poly(ethylene glycol) poly(propylene glycol),

at least one di- or poly isocyanate compound,

at least one polyfunctional compound having an average functionality greater than 2, or a mixture of such polyfunctional compounds,

a chain extender having the structure of Formula B:



where Q represents COOH, OH, SH or NH_2;

Z represents C, C=O, S or N;

R represents an alkyl group (generally a small alkyl group having a carbon backbone of 1 to 5 carbon atoms), and

n represents an integer from 1 to 25;

wherein 0.5 to 4 wt.% of the mixture is formed from the at least one polyfunctional compound and 0.5 to 20 wt.% of the mixture is formed from the chain extender;

wherein the reactants are reacted under substantially anhydrous conditions.

2. The polymer as claimed in claim 1 wherein at least 90 wt% of the mixture is formed from the components specified in claim 1.

3. The polymer as claimed in either one of claims 1 and 2 wherein 5 wt% or less of the mixture is formed from compounds having an average functionality of greater than two.

4. The polymer of any preceding claim wherein the mixture comprises at least 0.7 wt% of the mixture is formed from the at least one polyfunctional compound.

5. The polymer of any preceding claim wherein the at least one copolymer of ethylene oxide and propylene oxide has a number average molecular weight of less than 5000.

6. The polymer of claim 1 wherein:

30 to 70 wt.% of the mixture is formed from at least one poly(ethylene glycol) compound,

10 to 40 wt.% of the mixture is formed from at least one block copolymer of ethylene oxide-propylene oxide-ethylene oxide,

10 to 30 wt.% of the mixture is formed from at least one di- or poly isocyanate compound,

0.5 to 4 wt.% of the mixture is formed from at least one polyfunctional compound having an average functionality greater than 2, or a mixture of such polyfunctional compounds,

0.5 to 20 wt.% of the mixture is formed from di-propylene glycol.

7. The polymer of claim 6 wherein at least 50 wt.% of the mixture is formed from a combination of the PEG compound and the block copolymer of ethylene oxide-propylene oxide-ethylene oxide.

8. The polymer of any preceding claim in the form of a contact lens.

9. A polyurethane xerogel prepared from a mixture comprising:

i) a high molecular weight poly(ethylene glycol) compound having a number average molecular weight of 5000 to 7000, wherein 30 to 70 wt.% of the mixture is formed from the high molecular weight poly(ethylene glycol) compound;
ii) of a low molecular weight poly(ethylene glycol) compound having a number average molecular weight of 4500 or less, wherein 10 to 50 wt.% of the mixture is formed from the low molecular weight poly(ethylene glycol) compound;
iii) at least one di-isocyanate, wherein 10 to 50 wt.% of the mixture is formed from the at least one di-isocyanate;
iv) a polyol having a number average molecular weight of from 90 to 700, wherein 0.5 to 4 wt.% of the mixture is formed from the polyol;
v) a monofunctional poly(ethylene glycol) compound, wherein 0.5 to 2 wt.% of the mixture is formed from the monofunctional poly(ethylene glycol) compound;
vi) an antioxidant, wherein 0.1 to 2 wt.% of the mixture is formed from the antioxidant.

10. The polyurethane xerogel of claim 9 wherein 1 to 2 wt.% of the mixture is formed from the polyol.

11. The polyurethane xerogel of either one of claims 9 and 10 wherein the high molecular weight poly(ethylene glycol) compound has a number average molecular weight of from 5500 to 6500, preferably 6000 +/- 250.

12. The polyurethane xerogel of any one of claims 9 to 11 wherein the monofunctional PEG compound is PEG ME.

13. The polyurethane xerogel of any one of claims 9 to 12 prepared from a mixture consisting essentially of the recited components.

14. A process for preparing a polyurethane xerogel in the form of a moulded article, said process comprising the steps of:

(i) preparing a mixture as recited in any one of claims 1 to 7 and claims 9 to 13;

(ii) reacting the mixture formed in step (i) using substantially anhydrous materials to form a polyurethane xerogel;

(iii) reaction cast moulding the polyurethane xerogel to form a moulded article.

15. A process for preparing a contact lens comprising the steps of:

1. preparing a mixture as recited in any one of claims 1 to 7 and claims 9 to 13;
2. dispensing the reaction mixture formed in step i) into a contact lens mould;
3. allowing the reaction mixture to react and cure;
4. removing the contact lens from the mould; and hydrating the contact lens, in an aqueous fluid.