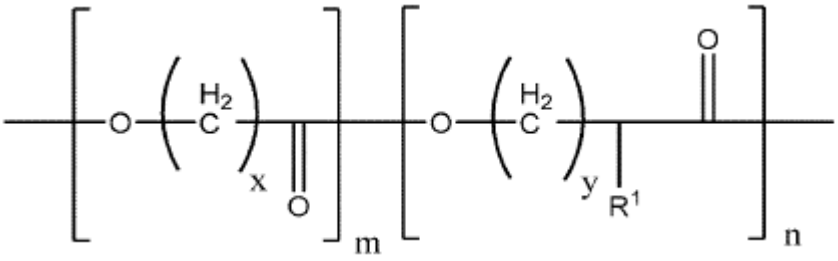
CLAIMS

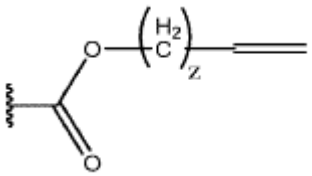
1. An article produced by additive manufacturing comprising a photopolymerization product of a precursor polymer, an alkylene oxide crosslinker, and a photoinitiator, the precursor polymer includes a first repeat unit comprising polycaprolactone (PCL) and a second repeat unit comprising allyl-ε-caprolactone (ACPCL), the alkylene oxide crosslinker comprises polyethylene glycol with acrylate end caps, the photopolymerization product includes at least one vinyl-terminated side-chain, and wherein the photopolymerization product comprises from 35% to 50% b/w vinyl-terminated sidechain functionalization and a Young's Modulus from 1.5 MPa or less at 37°C.

2. The article according to claim 1, wherein the precursor polymer has the following structure:



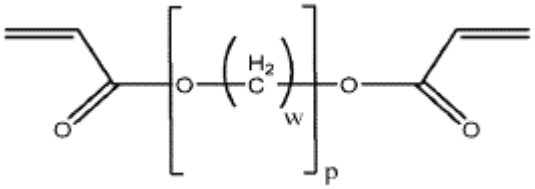
wherein, independently for each occurrence, m and n are integers from 5 - 400, having an m:n ratio from 1:1 to 20:1, wherein x and y are each independently an integer from 1 - 10; and R^1 includes a vinyl terminated side-chain.

3. The article according to claim 2, wherein R1 has the following structure:



wherein z is an integer from 1 – 10.

4. The article according to claim 2 or claim 3, wherein the alkylene oxide crosslinker has the following structure:



wherein w is an integer from 2 – 4, and p is an integer from 1 – 20.

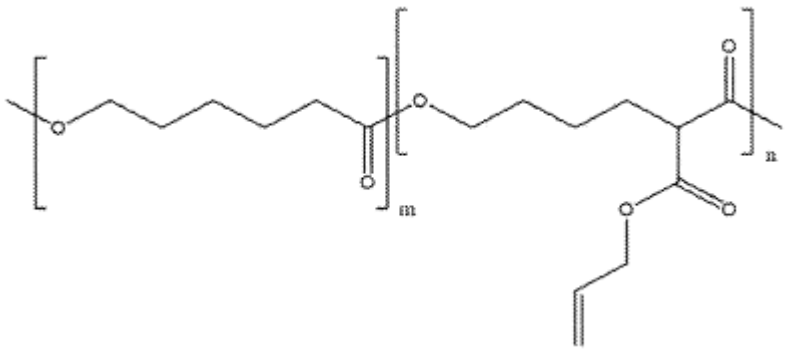
5. The article according to claim 1, wherein the precursor polymer comprises at least one labile bond.

6. The article according to claim 5, wherein the labile bond is formed from the reaction of the precursor polymer with D,L-dithiolthreitol.

7. The article according to claim 1, wherein a labile bond is formed from the reaction of the acrylate crosslinker with D,L-dithiolthreitol.

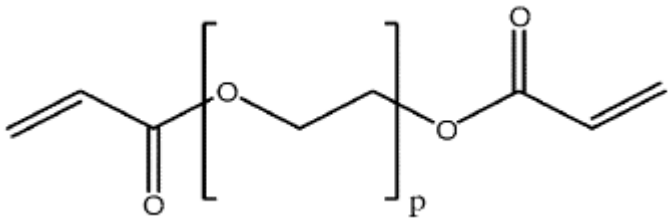
8. The article according to claim 6 or claim 7, wherein the article having the labile bond is configured to degrade at a faster rate compared to the article without the labile bond.

9. An article produced by additive manufacturing comprising a photopolymerization product of a precursor polymer and a photoinitiator, the precursor polymer having the following structure:



wherein, independently for each occurrence, m and n are integers from 5- 400, and wherein the m:n ratio is from 1:1 to 20:1, wherein the photopolymerization product comprises from 35% to 50 b/w vinyl-terminated sidechain functionalization;

wherein the photopolymerization product further comprises an alkylene oxide crosslinker having the following structure:



wherein p is an integer from 1 – 20; and

wherein a Young's Modulus is from 1.5MPa or less at 37°C.

10. The article according to claim 9, wherein the precursor polymer comprises at least one labile bond.

11. The article according to claim 10, wherein the labile bond is formed from the reaction of the precursor polymer with D,L-dithiolthreitol.

12. The article according to claim 9, wherein a labile bond is formed from the reaction of the alkylene oxide crosslinker with D,L-dithiolthreitol, and wherein the alkylene oxide crosslinker reacted with D,L-dithiolthreitol has a molecular weight between 200 and 6000 daltons.

13. The article according to claim 12, wherein the article having the labile bond is configured to degrade at a faster rate compared to the article without the labile bond.

14. A method of manufacturing an article via photopolymerization, the method comprising:

(i) providing a precursor solution, the precursor solution comprising a precursor polymer, acrylate crosslinker comprising alkylene oxide comprising polyethylene glycol with acrylate end caps, and photoinitiator; the precursor polymer including a first repeat unit comprising polycaprolactone (PCL) and a second repeat unit comprising allyl-ε-caprolactone (ACPCL), and the photopolymerization product includes at least one vinyl-terminated side-chain, wherein the photopolymerization product comprises from 35% to 50 b/w vinyl-terminated sidechain functionalization;

(ii) exposing the precursor solution to an intensity and frequency of light to initiate photopolymerization of the precursor polymer to form a layer of the article;

(iii) repeating step (ii) a number of times to form the article in a layer-by-layer configuration via the process of additive manufacturing.

15. The method according to claim 14, wherein the method further comprises providing a manufacturing device and heating at least a portion of said manufacturing device to 20°c to 80°C.

16. The method according to claim 14 or claim 15, wherein the method further comprises exposing the article to DMSO at a temperature of between 40°C to 60°C for at least 1 hour.