WHAT IS CLAIMED IS:

1. A process for the *in situ* production of a polyether from a hydroxyl group-containing vegetable oil, at least one alkylene oxide and a low molecular weight polyol having at least 2 hydroxyl groups in the presence of a catalyst comprising:

(a) introducing the hydroxyl group-containing vegetable oil, catalyst and alkylene oxide into a reactor,

(b) initiating reaction of hydroxyl group-containing vegetable oil and the alkylene oxide,

(c) after the reaction in (b) has begun but before the reaction has been 20% completed, continuously introducing the low molecular weight polyol having at least 2 hydroxyl groups into the reactor, and

(d) after the *in situ* made polyether polyol product having the desired molecular weight has been formed, removing that *in situ* made polyether polyol from the reactor.

2. The process of Claim 1 in which the hydroxyl group-containing vegetable oil is selected from the group consisting of castor oil, cashew nutshell oil, lesquerella oil, hydroxylated soybean oil, hydroxylated palm oil, hydroxylated sunflower oil, hydroxylated canola oil, hydroxylated linseed oil, hydroxylated cottonseed oil, hydroxylated tung oil, hydroxylated poppy seed oil, hydroxylated corn oil and hydroxylated peanut oil.

3. The process of Claim 1 in which the hydroxyl group-containing vegetable oil is castor oil.

4. The process of Claim 1 in which the hydroxyl group-containing vegetable oil is hydroxylated soybean oil.

5. The process of Claim 1 in which the alkylene oxide is selected from the group consisting of ethylene oxide, propylene oxide, 1,2- butylene oxide, 2,3-butylene oxide, isobutylene oxide, epichlorohydrin, cyclohexene oxide, styrene oxide, C_5-C_{30} α-alkylene oxides, polycarboxylic anhydrides, lactones and mixtures thereof.

6. The process of Claim 1 in which the alkylene oxide is a mixture of propylene oxide and ethylene oxide.

7. The process of Claim 1 in which the catalyst used in (a) is a DMC catalyst.

8. The process of Claim 1 in which the low molecular weight polyol having at least 2 hydroxyl groups is selected from the group consisting of propylene glycol, glycerin, sorbitol, sucrose, diglycerol, trimethylolpropane, pentaerythritol and mixtures thereof.

9. The process of Claim 1 in which the low molecular weight polyol having at least 2 hydroxyl groups is glycerin.

10. The process of Claim 1 in which the introduction of the low molecular weight polyol having at least 2 hydroxyl groups is begun after the reaction of alkylene oxide and the vegetable oil has proceeded to 1-20% completion.

11. The process of Claim 1 in which the vegetable oil and the polyol having at least two hydroxyl groups are used in relative amounts such that from 5 to 95 mole equivalents of vegetable oil are reacted with from 5 to 95 mole equivalents of the low molecular weight polyol having at least 2 hydroxyl groups.

12. The process of Claim 1 in which the hydroxyl group-containing vegetable oil is introduced into the reactor before the catalyst or the alkylene oxide.

13. The process of Claim 1 in which the hydroxyl group-containing vegetable oil and the catalyst are combined prior to their introduction into the reactor and the alkylene oxide is then introduced into the reactor.

14. The process of Claim 1 in which the hydroxyl group-containing vegetable oil, catalyst and alkylene oxide are each simultaneously introduced into the reactor on a continuous basis.

15. A process for the production of a polyurethane foam comprising reacting the polyether polyol of Claim 1 with a polyisocyanate in the presence of a blowing agent at an NCO/OH index of from 80 to 125.

16. The foam produced by the process of Claim 15.

CLAIMS

1. A process for the in situ production of a polyether from a hydroxyl group-containing vegetable oil, at least one alkylene oxide and a low molecular weight polyol having at least 2 hydroxyl groups in the presence of a catalyst comprising:

(a) introducing the hydroxyl group-containing vegetable oil, catalyst and alkylene oxide into a reactor,

(b) initiating reaction of hydroxyl group-containing vegetable oil and the alkylene oxide,

(c) after the reaction in (b) has begun but before the reaction has been 20% completed, continuously introducing the low molecular weight polyol having at least 2 hydroxyl groups and a molecular weight of less than 250 Da into the reactor, and

(d) after the in situ made polyether polyol product having the desired molecular weight has been formed, removing that in situ made polyether polyol from the reactor,

wherein the low molecular weight polyol having at least 2 hydroxyl groups is selected from the group consisting of propylene glycol, glycerin, sorbitol, sucrose, diglycerol, trimethylolpropane, pentaerythritol and mixtures thereof, and

wherein the amount of low molecular weight polyol having at least 2 hydroxyl groups is about 1.2% to 3%, based on the final in situ made polyether product weight.

2. The process of claim 1 in which the hydroxyl group-containing vegetable oil is selected from the group consisting of castor oil, cashew nutshell oil, lesquerella oil, hydroxylated soybean oil, hydroxylated palm oil, hydroxylated sunflower oil, hydroxylated canola oil, hydroxylated linseed oil, hydroxylated cottonseed oil, hydroxylated tung oil, hydroxylated poppy seed oil, hydroxylated corn oil and hydroxylated peanut oil.

3. The process of claim 1 in which the hydroxyl group-containing vegetable oil is castor oil.

4. The process of claim 1 in which the hydroxyl group-containing vegetable oil is hydroxylated soybean oil.

5. The process of claim 1 in which the alkylene oxide is selected from the group consisting of ethylene oxide, propylene oxide, 1,2-butylene oxide, 2,3-butylene oxide, isobutylene oxide, epichlorohydrin, cyclohexene oxide, styrene oxide, C_5-C_{30} α-alkylene

oxides, polycarboxylic anhydrides, lactones and mixtures thereof.

6. The process of claim 1 in which the alkylene oxide is a mixture of propylene oxide and ethylene oxide.

7. The process of claim 1 in which the catalyst used in (a) is a DMC catalyst.

8. The process of claim 1 in which the low molecular weight polyol having at least 2 hydroxyl groups is glycerin.

9. The process of claim 1 in which the introduction of the low molecular weight polyol having at least 2 hydroxyl groups is begun after the reaction of alkylene oxide and the vegetable oil has proceeded to 1-20% completion.

10. The process of claim 1 in which the vegetable oil and the polyol having at least two hydroxyl groups are used in relative amounts such that from 5 to 95 mole equivalents of vegetable oil are reacted with from 5 to 95 mole equivalents of the low molecular weight polyol having at least 2 hydroxyl groups.

11. The process of claim 1 in which the hydroxyl group-containing vegetable oil is introduced into the reactor before the catalyst or the alkylene oxide.

12. The process of claim 1 in which the hydroxyl group-containing vegetable oil and the catalyst are combined prior to their introduction into the reactor and the alkylene oxide is then introduced into the reactor.

13. The process of claim 1 in which the hydroxyl group-containing vegetable oil, catalyst and alkylene oxide are each simultaneously introduced into the reactor on a continuous basis.

14. A process for the production of a polyurethane foam comprising reacting the polyether polyol of claim 1 with a polyisocyanate in the presence of a blowing agent at an NCO/OH index of from 80 to 125.

15. The foam produced by the process of claim 14.