**1. Single Step**

Overview

**Steps/Stages**

1.1

**Notes**

Reactants: 1, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

Tetrahydrofuran

By Mueller, Herbert and Palm, Christof

From Ger. Offen., 3406471, 19 Sep 1985



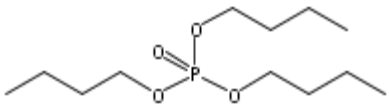
**2. 2 Steps**

Overview

**Steps/Stages**

1.1 R:$H_3PO_4$

2.1 R:



R:Graphite, R:$NaH_2PO_4$

**Notes**

1) Classification: Cyclisation; Heterocycle formation; Condensation; Etherification; # Conditions: H3PO4 distil 165 deg; # Comments: other examples, 2) Classification: Ether cleavage; Ring cleavage; Elimination; Dehydration; # Conditions: NaH2PO4; (BuO)3PO graphite; 280 deg; # Comments: yield >90%, other examples, Reactants: 1, Reagents: 4, Steps: 2, Stages: 2, Most stages in any one step: 1

**References**

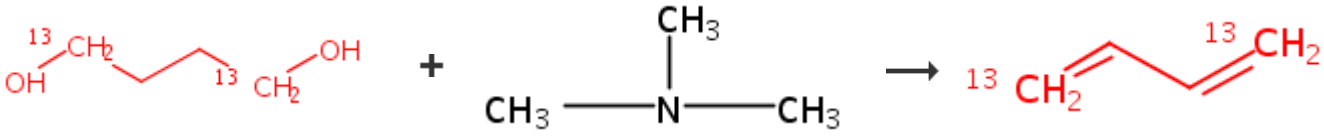
Ethynylation. V. Reactions of hydrated ethynylation products. Dehydration of γ-alkanediols

By Reppe, Walter and et al.

From Annalen der Chemie, Justus Liebigs, 596, 80-158; 1955



**3. 3 Steps**



[Step 2.1]

Overview

**Steps/Stages**

1.1 R:HBr

2.1 R:$Ag_2O$

3.1

**Notes**

Reactants: 2, Reagents: 2, Steps: 3, Stages: 3, Most stages in any one step: 1

**References**

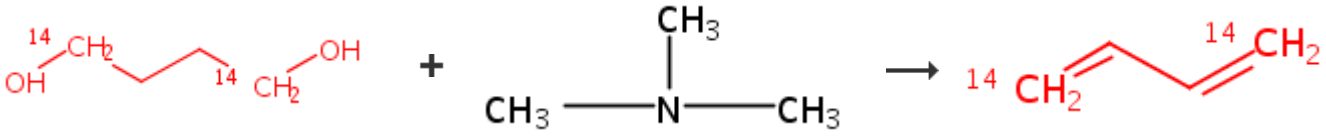
A new method for studying chain conformation. Proof of nonradial binding to micelles: chain-bending at an enzyme surface

By Menger, F. M. and Carnahan, D. W.

From Journal of the American Chemical Society, 108(6), 1297-8; 1986



**4. 4 Steps**




[Step 2.1]

Overview

**Steps/Stages**

1.1 R:HBr, S:$H_2O$, reflux

2.1 S:EtOH

3.1 R:$Ag_2O$, S:$H_2O$

4.1 250°C

**Notes**

3) in-situ generated reagent, 4) thermal, Reactants: 2, Reagents: 2, Solvents: 2, Steps: 4, Stages: 4, Most stages in any one step: 1

**References**

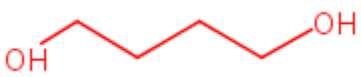
Synthesis of (14C6-3,4,7,8,11,12)-(1E,5E,9E)-cyclododeca-1,5,9-triene

By Diel, Bruce N. et al

From Journal of Labelled Compounds and Radiopharmaceuticals, 50(5-6), 407-409; 2007



**5. Single Step**

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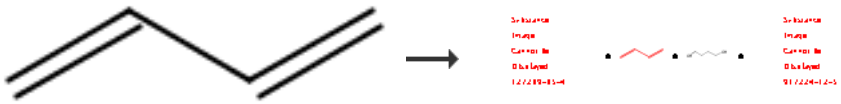


hydroxy-terminated

Overview

**Steps/Stages**

1.1 30 min, 45°C; 45°C → 80°C; 4.5 h, 80°C

**Notes**

thermal, solid state, unspecified mercury salt used as a catalyst, molten conditions, no solvent, Reactants: 4, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

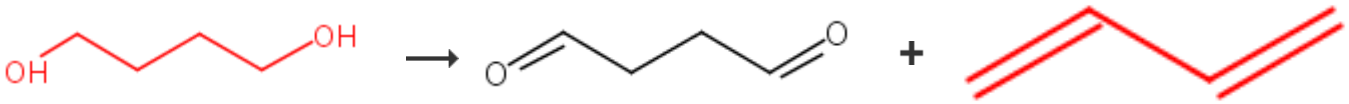
Polyester-modified polybutadienols for producing polyurethane elastomers and thermoplastic polyurethanes

By Eling, Berend et al

From PCT Int. Appl., 2016026807, 25 Feb 2016



**6. Single Step**




Overview

**Steps/Stages**

1.1 C:152417-31-7

**Notes**

GAS-PHASE, FLOW REACTOR, BARIUM-PROMOTED CATALYST, SELECTIVITY FOR SUCCINALDEHYDE DECREASED WITH INCREASING TEMP. AND WITH DURATION OF REACTION, Reactants: 1, Catalysts: 1, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

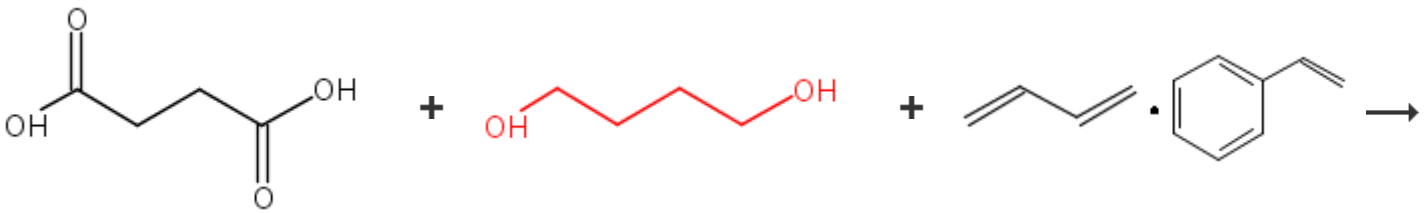
Synthesis of succinaldehyde by dehydrogenation of 1,4-butanediol using copper chromite catalyst in vapor phase

By Pillai, R. B. C.

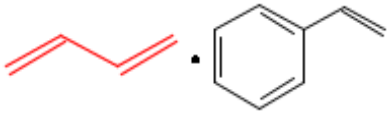
From Indian Journal of Chemistry, Section B: Organic Chemistry Including Medicinal Chemistry, 33B(11), 1087-8; 1994



**7. 2 Steps**



hydrogenated, maleated
[Step 2.1]



hydrogenated, maleated, graft copolymer wi

Overview

**Steps/Stages**

1.1 3 h, 190°C
2.1 S:$CHCl_3$, 24 h, 80°C

**Notes**

1) no experimental detail, 2) thermal, Reactants: 3, Solvents: 1, Steps: 2, Stages: 2, Most stages in any one step: 1

**References**

"Grafting to" as a Novel and Simple Approach for Triple-Shape Memory Polymers

By Suchao-in, Kanitporn and Chirachanchai, Suwabun

From ACS Applied Materials & Interfaces, 5(15), 6850-6853; 2013

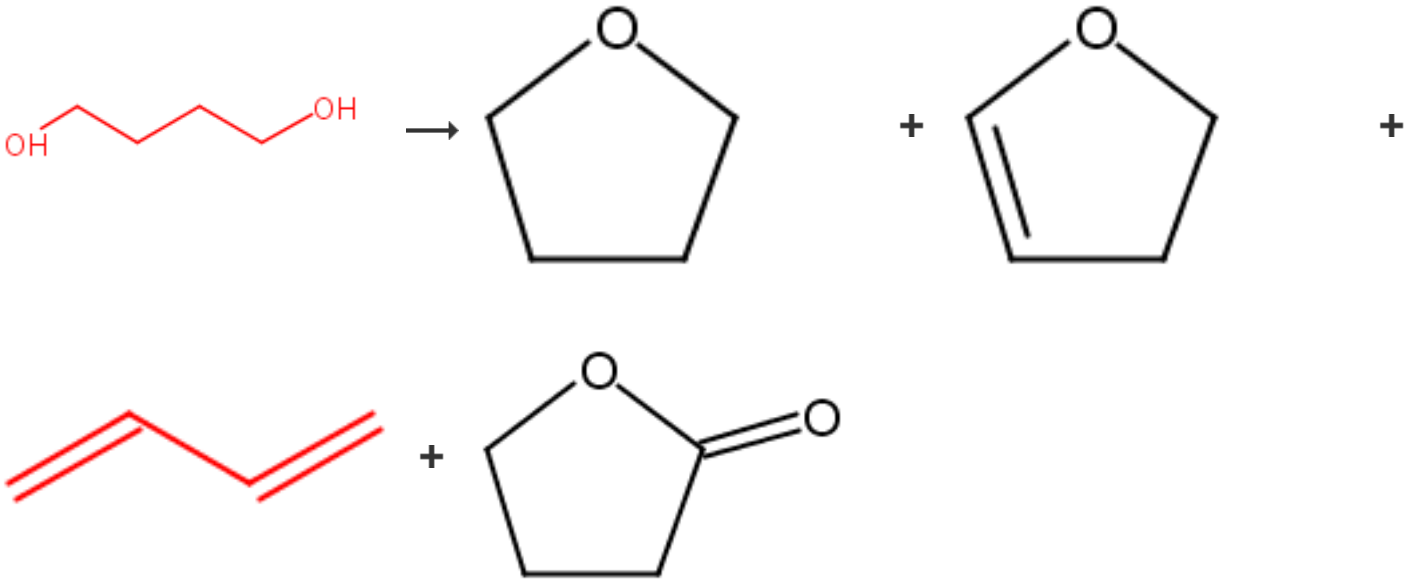
Experimental Procedure

**Step 1**
Poly(butylene succinate) (PBS) Succinic acid (SA) (7.9 g, 67 mmol) and 1-4 butanediol (BD) (6.3 g, 70 mmol) were mixed into a 250 mL in a three-necked round-bottom flask equipped with a mechanical stirrer, a nitrogen inlet and a vigreux condenser. The mixture was heated at 190 °C for 3 hr. The crude product was dissolved in chloroform and precipitated in cold dried methanol. The product was filtrated and extensively washed with copious cold methanol and then dried under reduced pressure at 50 °C for 48 hr. Diol terminated PBS6 (13.1g, 92%). IR (KBr): $\nu_{max}/cm^{-1}$ 2966m (C-H), 2857w (C-H), and 1740s (C=O); $^1H$ NMR (500 MHz, $CDCl_3$, δ): 4.1 (2H, t, $CH_2$), 2.6 (2H, s, $CH_2$), and 1.7 (2H, m, $CH_2$).

**Step 2**
SEBS-g-PBS PBS6 (0.05 g, 0.02 mmol) and m-SEBS (5 g, 62.5 mmol) were mixed into a 100 mL threenecked round-bottom flask equipped with a mechanical stirrer, a nitrogen inlet and a vigreux condenser at 80 °C for 24 hr by using chloroform as a solvent. The viscous product was dissolved with excess amount of xylene and the insoluble part was filtrated. The product was collected after reprecipitation in acetone and drying under pressure at 80 °C for 24 hr. SEBS-g-PBS6 (4g, 80%). IR (ZnSe): $\nu_{max}/cm^{-1}$ 2966m (C-H), 2960w (C-H), 2923s (C-H), 2852m (C-H), 1740s (C=O), 1461s (C-H), 1378m (C-H), 762m (C-H), 721w (C-H), and 700w (C-H); $^1H$ NMR (500 MHz, $CDCl_3$, δ). 6.3 (1H, m, CH), 4.1 (t, 2H; $CH_2$), 2.6 (2H, s, $CH_2$), and 1.7 (2H, m, $CH_2$), and 1.2 (2H, m, $CH_2$).



**8. Single Step**



Overview

**Steps/Stages**

1.1 C:CuO, C:ZnO, C:$Al_2O_3$

**Notes**

thermal [300°, 100% conversion, 98% THF]; product yields dependent on temp. and catalyst mix, Reactants: 1, Catalysts: 3, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

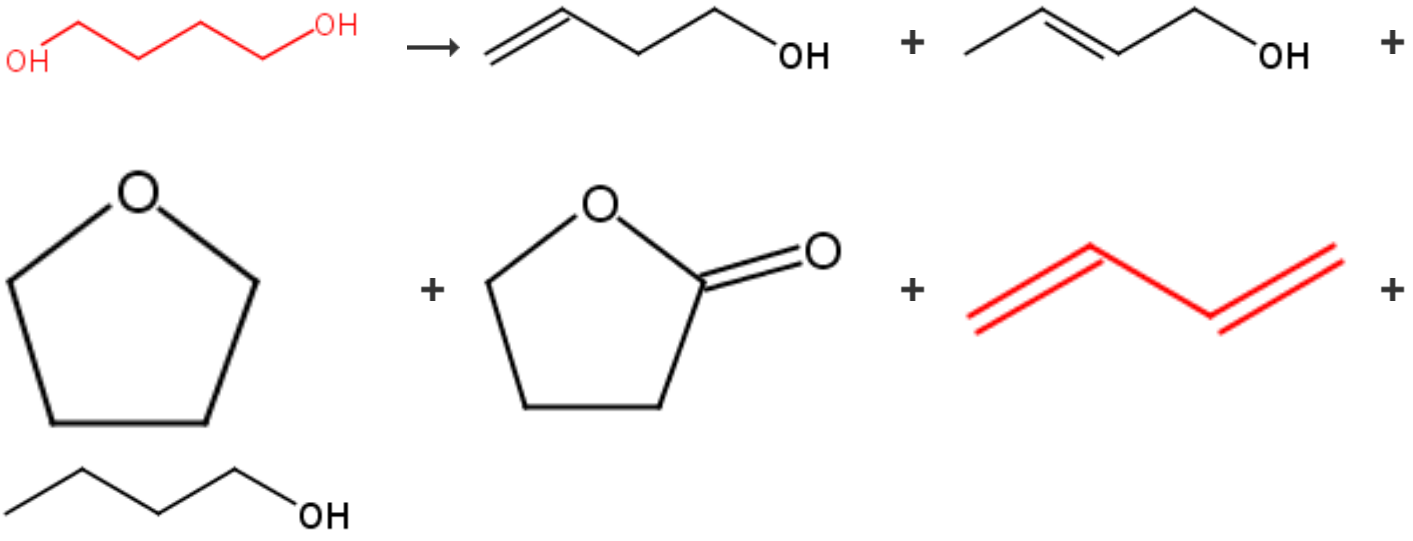
Catalytic conversion of 1,4-butanediol

By Kadirova, N. T. et al

From O'zbekiston Kimyo Jurnali, (3), 31-32; 2000



**9. Single Step**



Overview

**Steps/Stages**

1.1 C:$Tm_2O_3$, 5 h, 350°C

**Notes**

gas phase, thermal, optimized on catalyst, 80% selectivity to 3-buten-1-ol, flow system used, optimization study, fixed bed reactor used, 74% conversion, other products also detected, Reactants: 1, Catalysts: 1, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

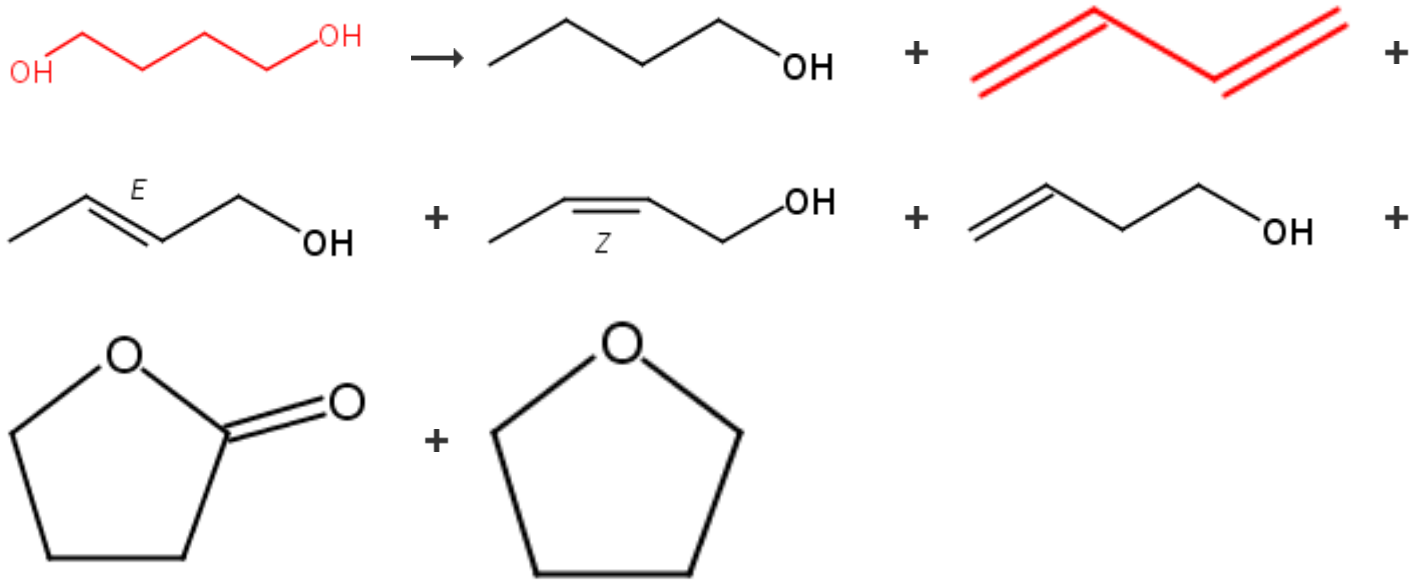
Dehydration of 1,5-pentanediol over bixbyite Sc2-xYbxO3 catalysts

By Sato, Fumiya and Sato, Satoshi

From Catalysis Communications, 27, 129-133; 2012



**10. Single Step**




Overview

**Steps/Stages**

1.1 C:$CeO_2$, 425°C

**Notes**

no solvent, thermal, 74% conversion, conversion and product distribution depend on the reaction temp., Reactants: 1, Catalysts: 1, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

Dehydration of diols catalyzed by CeO2

By Sato, Satoshi et al

From Journal of Molecular Catalysis A: Chemical, 221(1-2), 177-183; 2004



**11. Single Step**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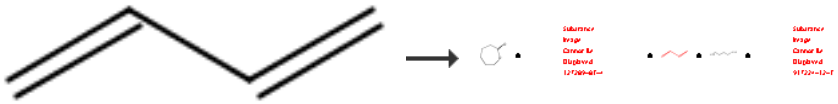


Overview

**Steps/Stages**

1.1 30 min, 45°C; 45°C → 80°C; 4.5 h, 80°C

**Notes**

thermal, solid state, unspecified mercury salt used as a catalyst, molten conditions, no solvent, Reactants: 4, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

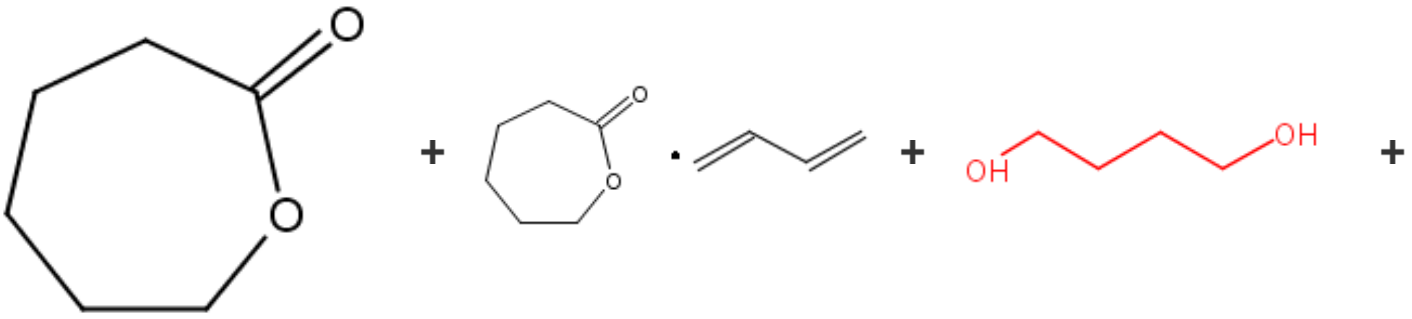
Polyester-modified polybutadienols for producing polyurethane elastomers and thermoplastic polyurethanes

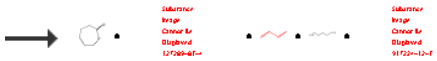
By Eling, Berend et al

From PCT Int. Appl., 2016026807, 25 Feb 2016



**12. Single Step**



Substance Image Cannot Be Displayed 917224-12-5 + Substance Image Cannot Be Displayed 127289-85-4 → 

Overview

**Steps/Stages**

1.1 30 min, 45°C; 45°C → 80°C; 4.5 h, 80°C

**Notes**

thermal, solid state, unspecified mercury salt used as a catalyst, molten conditions, no solvent, optimization study, optimized on monomeric ratio, Reactants: 5, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

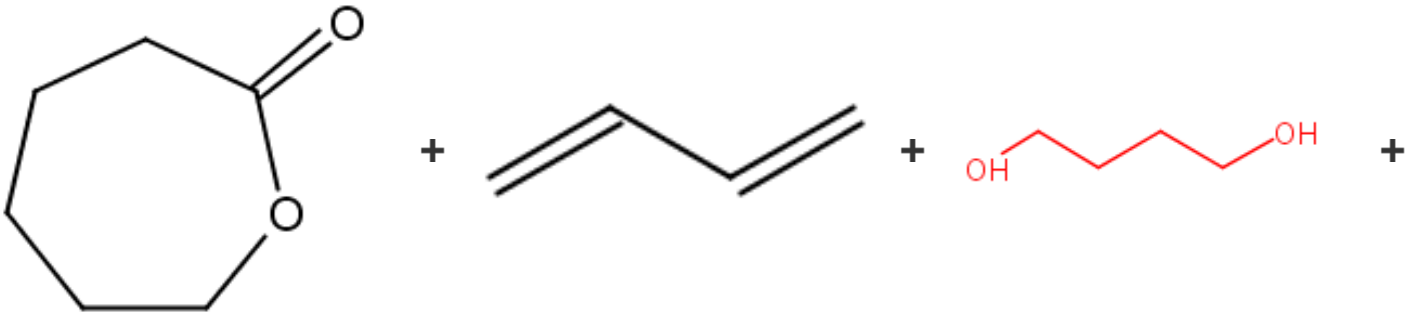
Polyester-modified polybutadienols for producing polyurethane elastomers and thermoplastic polyurethanes

By Eling, Berend et al

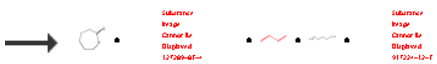
From PCT Int. Appl., 2016026807, 25 Feb 2016



**13. 2 Steps**




hydroxy-terminated [Step 2.1]

Substance Image Cannot Be Displayed 917224-12-5 + Substance Image Cannot Be Displayed 127289-85-4 → 

[Step 2.1] [Step 2.1]

Overview

**Steps/Stages**

1.1 C:Ti(OBu)$_4$, 4 h, 150°C
2.1 30 min, 45°C; 45°C → 80°C; 4.5 h, 80°C

**Notes**

1) reaction in a sealed steel reactor, alternative preparation shown, alternate reaction conditions also shown, 2) thermal, solid state, unspecified mercury salt used as a catalyst, molten conditions, no solvent, optimization study, optimized on monomeric ratio, Reactants: 5, Catalysts: 1, Steps: 2, Stages: 2, Most stages in any one step: 1

**References**

Polyester-modified polybutadienols for producing polyurethane elastomers and thermoplastic polyurethanes

By Eling, Berend et al

From PCT Int. Appl., 2016026807, 25 Feb 2016



**14. 2 Steps**

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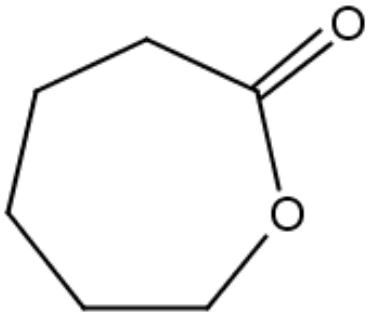


[Step 2.1]

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[Step 2.1]

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127289-85-4

[Step 2.1]

Overview

**Steps/Stages**

**Notes**

1.1 C:Ti(OBu)$_4$, 2 h, 120°C
2.1 30 min, 45°C; 45°C → 80°C; 4.5 h, 80°C

1) reaction in a sealed glass reactor, alternative preparation shown, alternate reaction conditions also shown, 2) thermal, solid state, unspecified mercury salt used as a catalyst, molten conditions, no solvent, optimization study, optimized on monomeric ratio, Reactants: 5, Catalysts: 1, Steps: 2, Stages: 2, Most stages in any one step: 1

**References**

Polyester-modified polybutadienols for producing polyurethane elastomers and thermoplastic polyurethanes

By Eling, Berend et al

From PCT Int. Appl., 2016026807, 25 Feb 2016



**15. 2 Steps**

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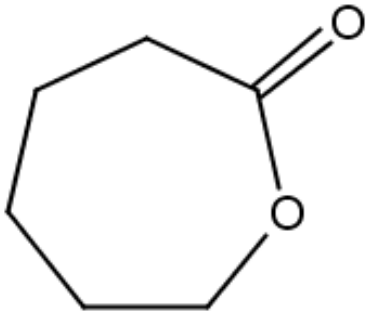


[Step 2.1]

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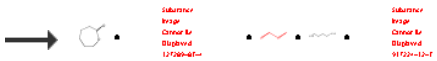
[Step 2.1]

Substance Image Cannot Be Displayed 127289-85-4

[Step 2.1]



Overview

**Steps/Stages**

**Notes**

1.1 C:Ti(OBu)$_4$, 2 h, 120°C
2.1 30 min, 45°C; 45°C → 80°C; 4.5 h, 80°C

1) reaction in a sealed glass reactor, alternative preparation shown, alternate reaction conditions also shown, 2) thermal, solid state, unspecified mercury salt used as a catalyst, molten conditions, no solvent, optimization study, optimized on monomeric ratio, Reactants: 5, Catalysts: 1, Steps: 2, Stages: 2, Most stages in any one step: 1

**References**

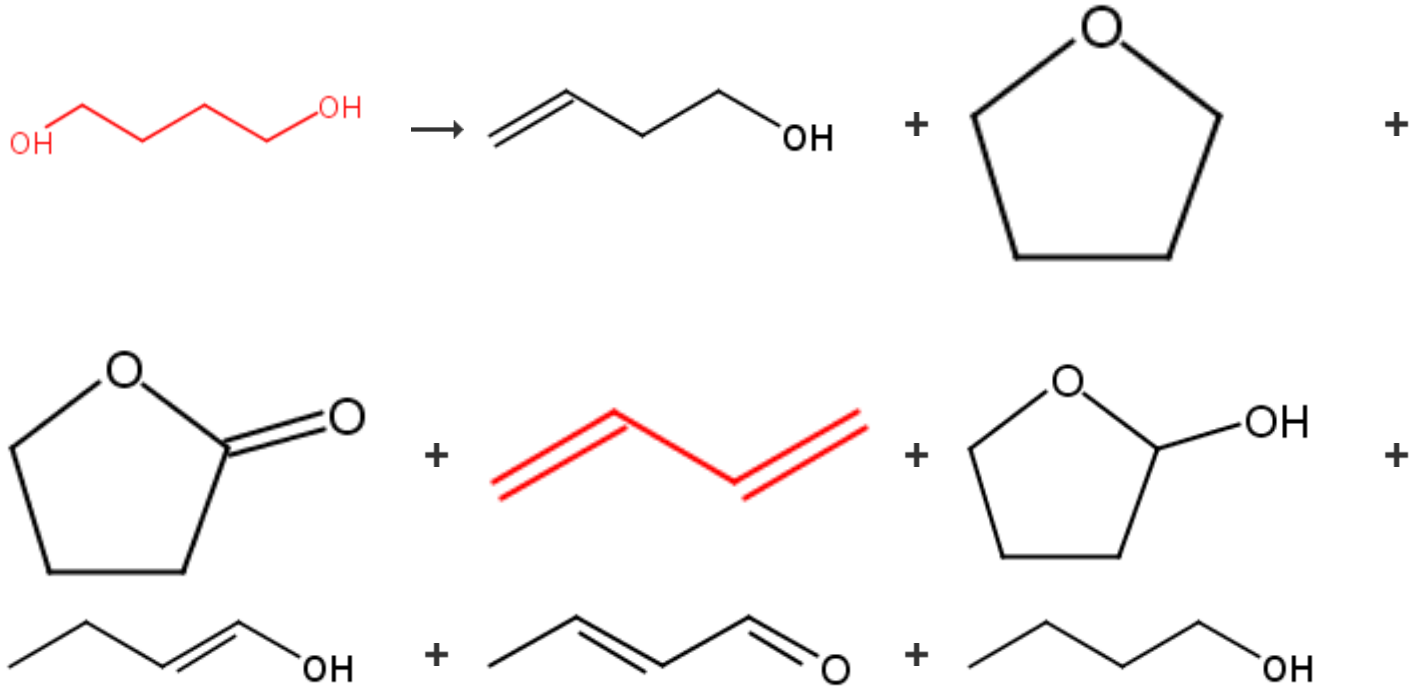
Polyester-modified polybutadienols for producing polyurethane elastomers and thermoplastic polyurethanes

By Eling, Berend et al

From PCT Int. Appl., 2016026807, 25 Feb 2016



**16. Single Step**




Overview

**Steps/Stages** **Notes**

1.1 C:$ZrO_2$, C:NaOH, 5 h, 325°C

optimization study, optimized on catalyst, sodium-modified monoclinic ZrO2 used, selectivity depends on sodium content in catalyst, 71.8% selectivity to 3-buten-1-ol at 18.7% conversion, no solvent, Reactants: 1, Catalysts: 2, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

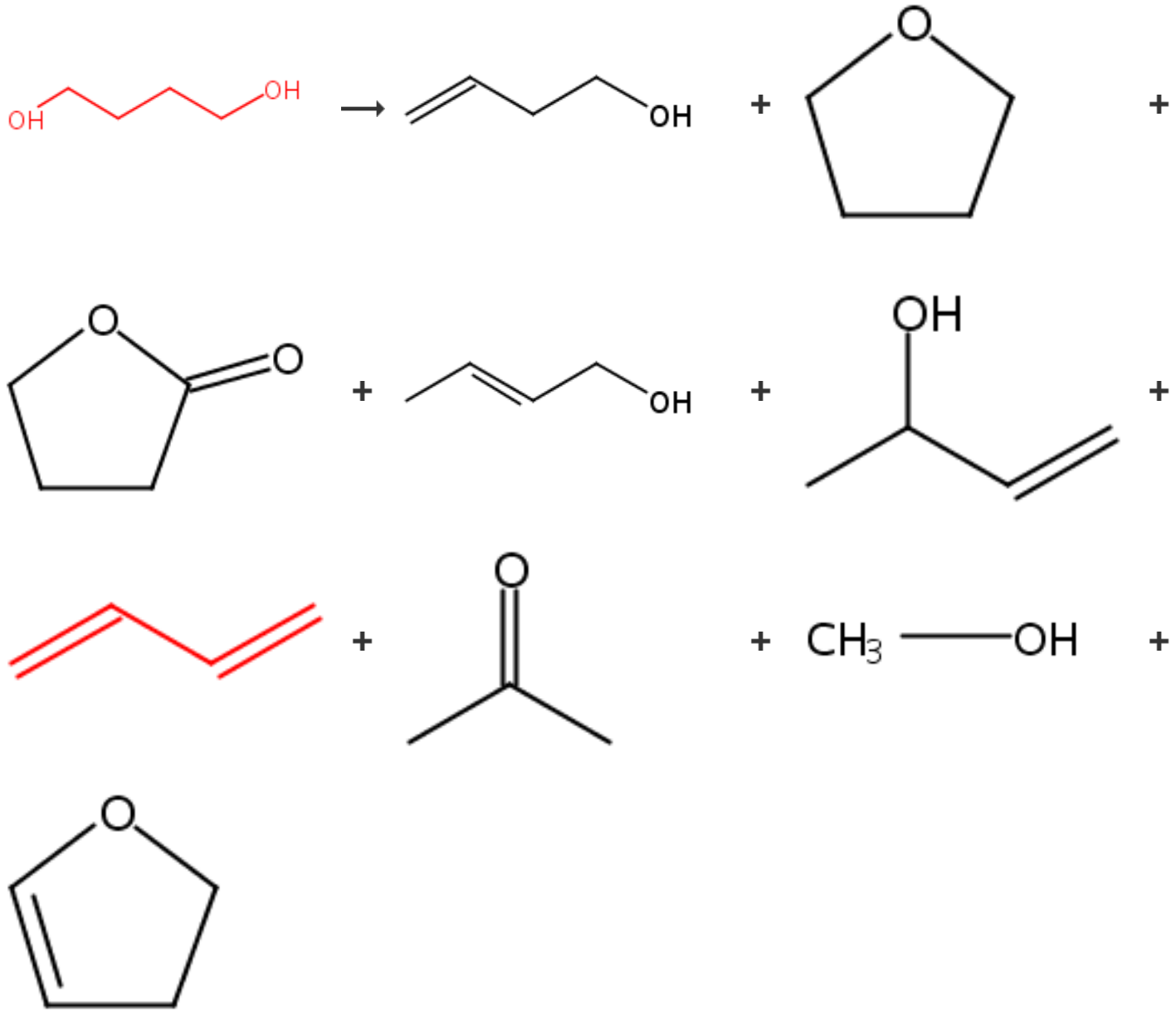
Synthesis of 3-buten-1-ol from 1,4-butanediol over ZrO2 catalyst

By Yamamoto, Naoki et al

From Journal of Molecular Catalysis A: Chemical, 243(1), 52-59; 2006



**17. Single Step**



Overview

**Steps/Stages**

1.1 C:$In_2O_3$, 375°C

**Notes**

optimized on calcination temperature of the catalyst for conversion and 3-Buten-1-ol selectivity, catalyst prepared and used, fixed bed downflow reactor used, optimization study, 79.6% conversion, Reactants: 1, Catalysts: 1, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

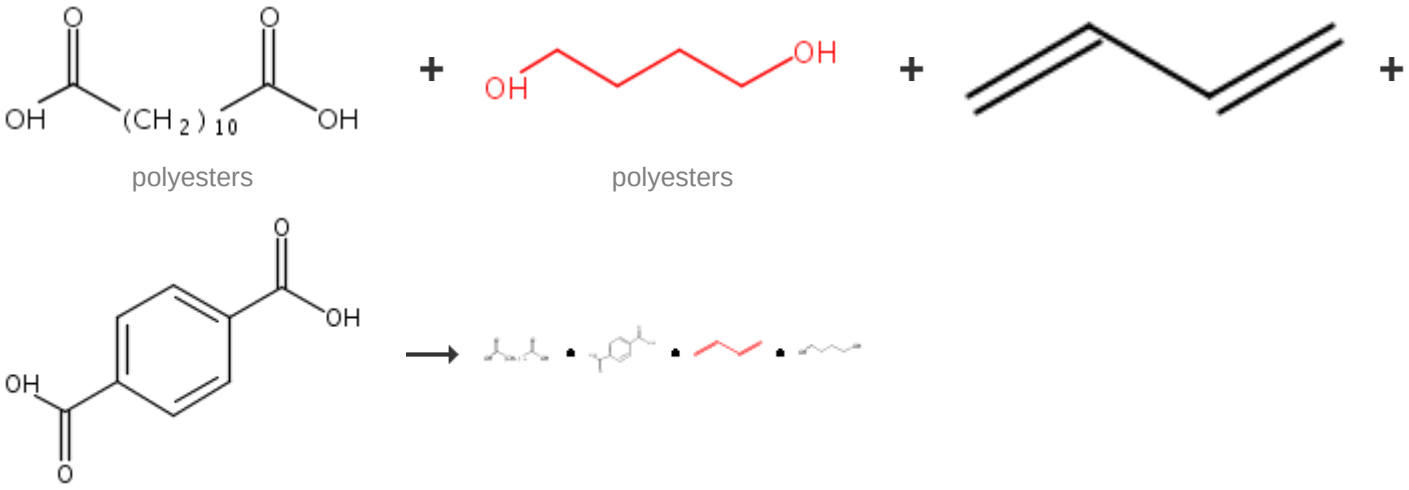
Synthesis of 3-buten-1-ol from 1,4-butanediol over indium oxide

By Takahashi, Ryoji et al

From Applied Catalysis, A: General, 383(1-2), 134-140; 2010



**18. Single Step**




Overview

**Steps/Stages**

1.1 C:$Ti(OBu)_4$, rt → 240°C; 60 min, 240°C; 4 h, 240°C

**Notes**

product depends on stoichiometry, Reactants: 4, Catalysts: 1, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

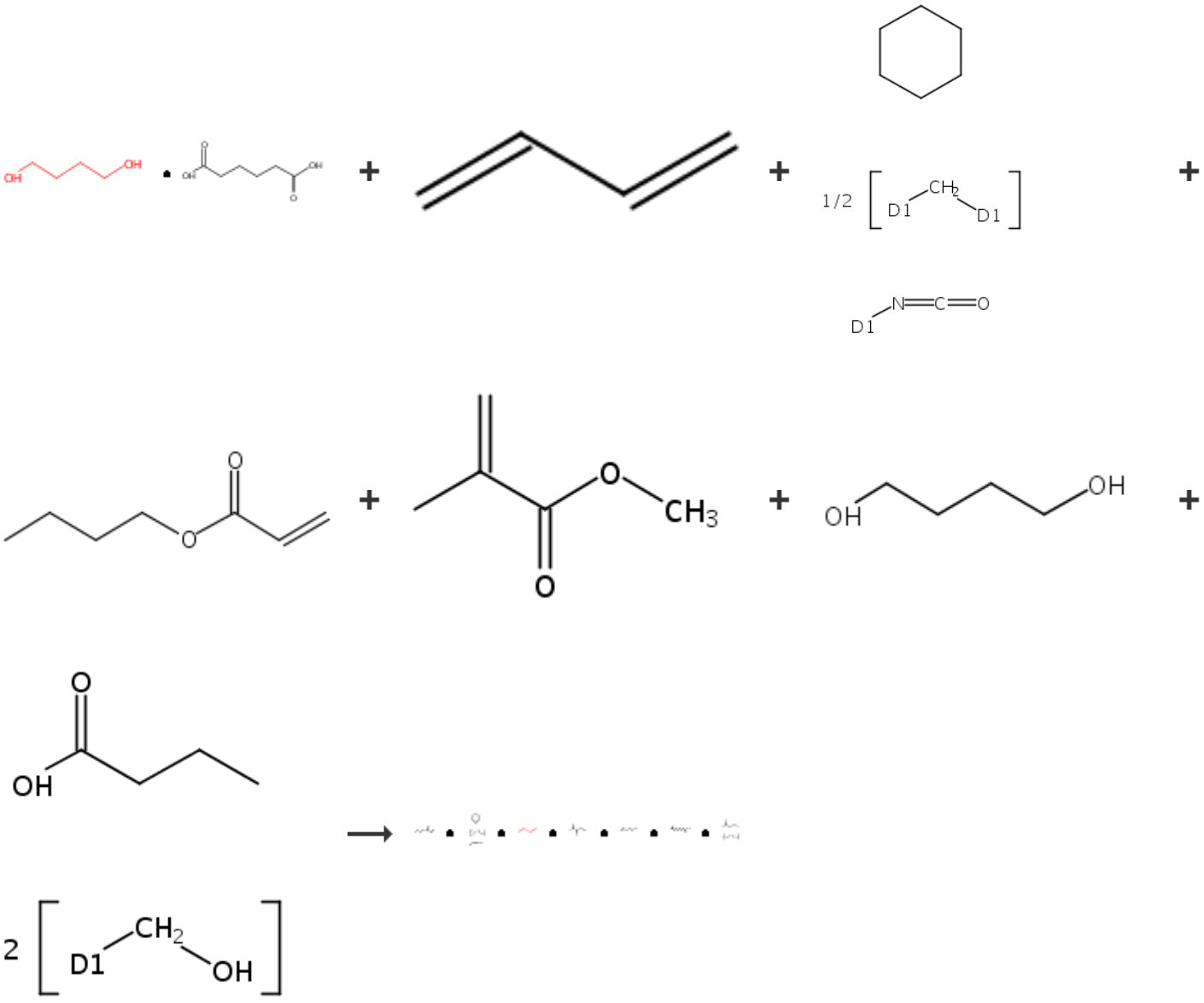
Thermally conductive polymer compositions with good flexibility, and heat and impact resistance, and their moldings

By Kida, Naomi et al

From Jpn. Kokai Tokkyo Koho, 2013159698, 19 Aug 2013



**19. Single Step**




Overview

**Steps/Stages**

1.1 1 h, 90°C

1.2 C:301-10-0, C:$Bu_2Sn$ dilaurate, 3.5 h, 90°C → 60°C

1.3 R:$Et_3N$, C:AIBN, cooled; 1 min, cooled

1.4 R:$H_2NCH_2CH_2NH_2$ (polymers), S:$H_2O$, 2 min, 15°C; 20 h, 15°C; 1.5 h, 15°C → 85°C; 2 h, 85°C

1.5 C:$(NH_4)_2S_2O_8$, S:$H_2O$, 40 min, 85°C; 1.5 h, 85°C

**Notes**

Reactants: 7, Reagents: 2, Catalysts: 4, Solvents: 1, Steps: 1, Stages: 5, Most stages in any one step: 5

**References**

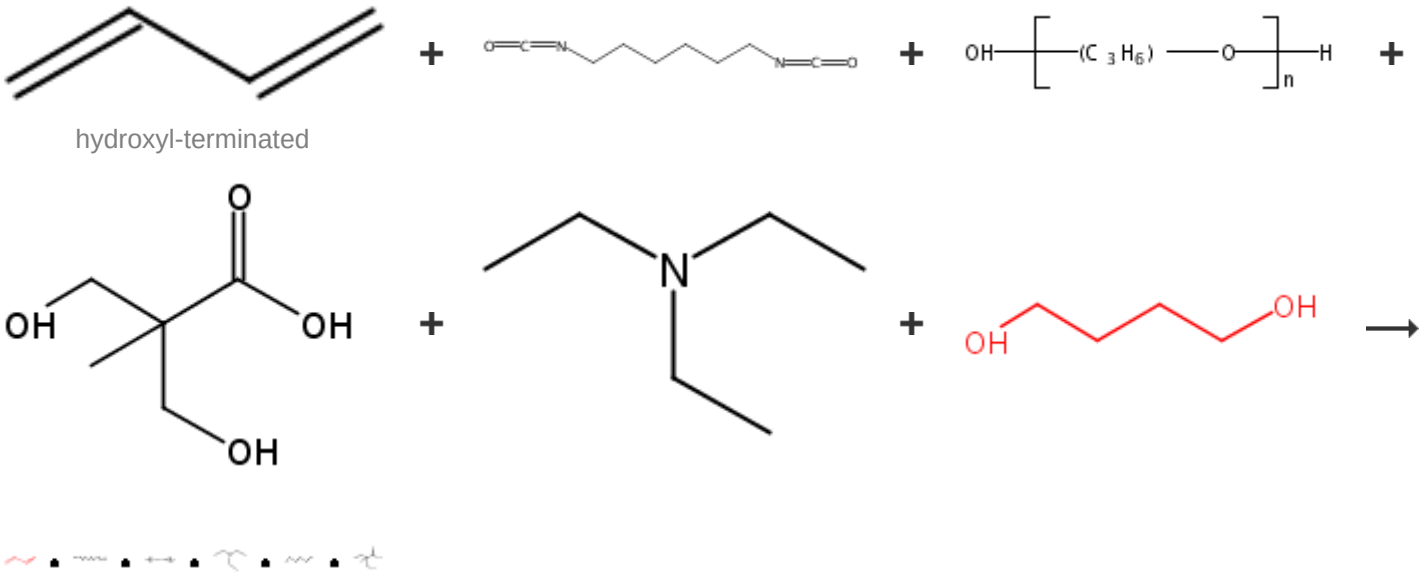
Preparation of polybutadiene-modified polyurethane-acrylate emulsion

By Gao, Mingzhi

From Faming Zhuanli Shenqing, 105037641, 11 Nov 2015



**20. Single Step**




Overview

**Steps/Stages**

1.1 C:$Bu_2Sn$ dilaurate, rt
1.2 rt

1.3

**Notes**

Reactants: 6, Catalysts: 1, Steps: 1, Stages: 3, Most stages in any one step: 3

**References**

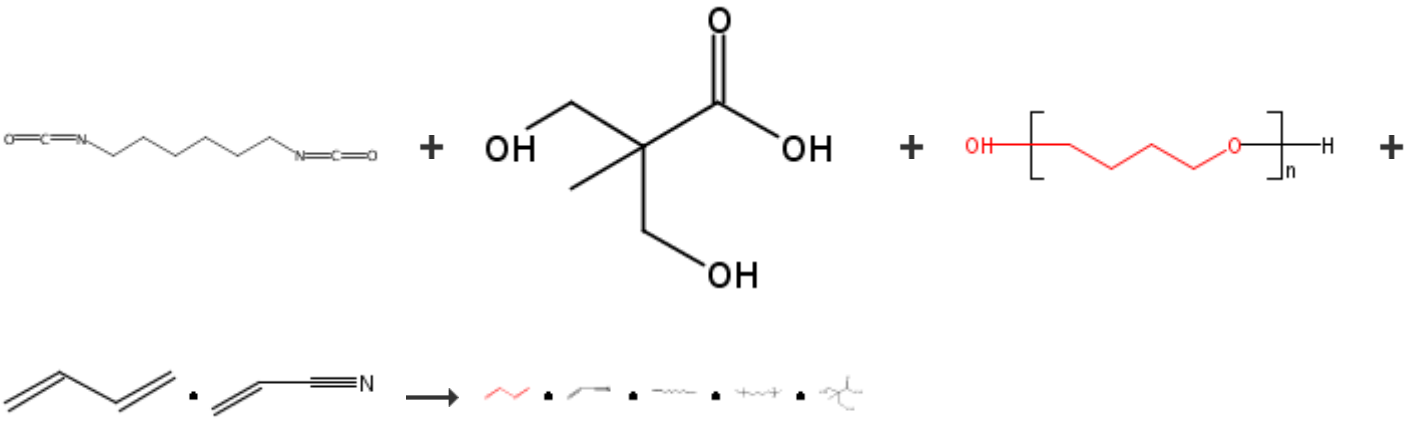
Influence of Polyol Molecular Weight and Type on the Tack and Peel Properties of Waterborne Polyurethane Pressure-Sensitive Adhesives

By Akram, Nadia et al

From Macromolecular Reaction Engineering, 7(10), 493-503; 2013



**21. Single Step**



Overview

**Steps/Stages**

**Notes**

1.1 C:$Bu_2Sn$ dilaurate, S:THF, 2 h, 65°C
1.2 S:THF, rt

1.3 R:LiOH, S:MeOH, S:EtC(=O)Me, 30 min, rt

Reactants: 4, Reagents: 1, Catalysts: 1, Solvents: 3, Steps: 1, Stages: 3, Most stages in any one step: 3

**References**

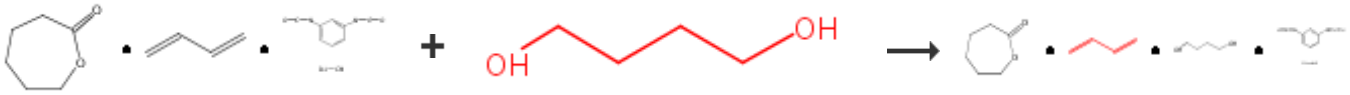
Photosensitive resin composition for flexographic printing plate production

By Oshimo, Chihiro et al

From Eur. Pat. Appl., 884649, 16 Dec 1998



**22. Single Step**




Overview

**Steps/Stages**

1.1 3 min, 80°C; 2 h, 100°C; 15 h, 110°C; 14 h, 100°C

**Notes**

Reactants: 2, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

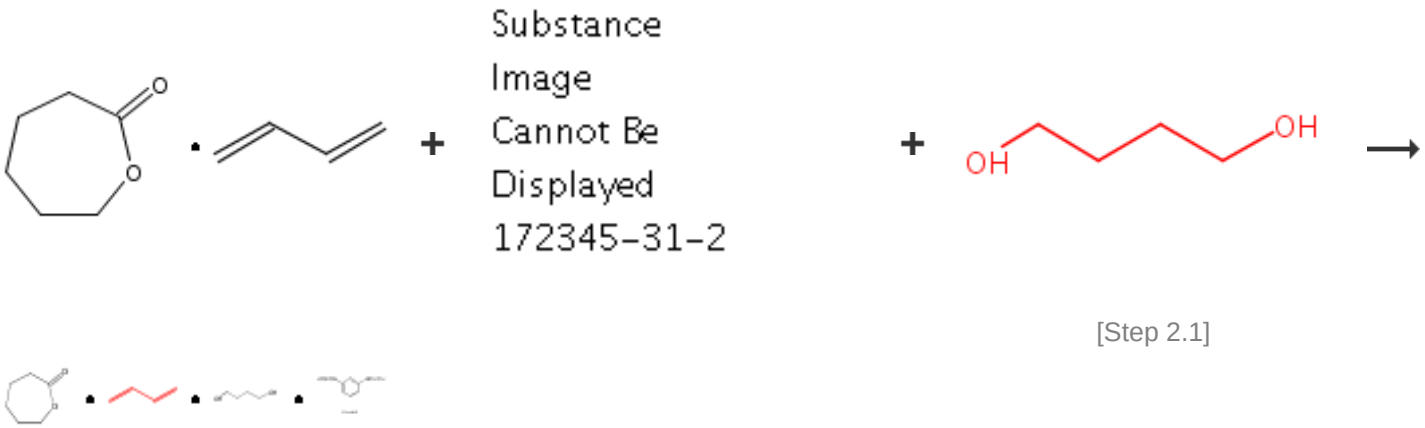
Polyol composition, manufacture of polyol composition, urethane prepolymer, and polyurethane with good storage stability and mechanical properties

By Nakamura, Mitsuhiro and Kimizuka, Shinichi

From PCT Int. Appl., 2015060302, 30 Apr 2015



**23. 2 Steps**




[Step 2.1]

Overview

**Steps/Stages**

**Notes**

1.1 1 h, 80°C
2.1 3 min, 80°C; 2 h, 100°C; 15 h, 110°C; 14 h, 100°C

Reactants: 3, Steps: 2, Stages: 2, Most stages in any one step: 1

**References**

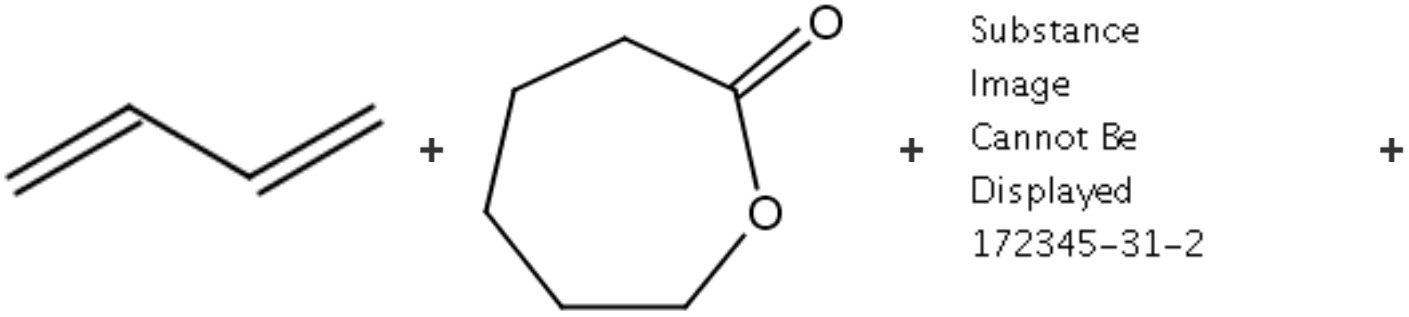
Polyol composition, manufacture of polyol composition, urethane prepolymer, and polyurethane with good storage stability and mechanical properties

By Nakamura, Mitsuhiro and Kimizuka, Shinichi

From PCT Int. Appl., 2015060302, 30 Apr 2015



**24. 3 Steps**




of 1,2-configuration, hydroxy-terminated

[Step 2.1]

[Step 3.1]

Overview

**Steps/Stages**

1.1 C:838-85-7, 60°C → 100°C; 7 h, 100°C
2.1 1 h, 80°C
3.1 3 min, 80°C; 2 h, 100°C; 15 h, 110°C; 14 h, 100°C

**Notes**

Reactants: 4, Catalysts: 1, Steps: 3, Stages: 3, Most stages in any one step: 1

**References**

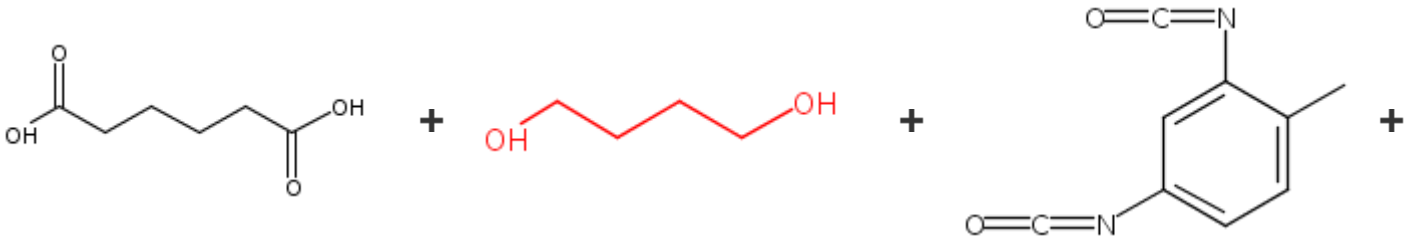
Polyol composition, manufacture of polyol composition, urethane prepolymer, and polyurethane with good storage stability and mechanical properties

By Nakamura, Mitsuhiro and Kimizuka, Shinichi

From PCT Int. Appl., 2015060302, 30 Apr 2015



**25. Single Step**



polymers with hydroxy-terminated polybutad

polymers with hydroxy-terminated polybutad

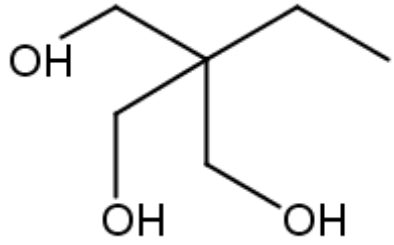
polyurethane acrylates, polymers with merc

reaction products with pentaerythritol tri

Overview

**Steps/Stages**

1.1 R:



(polymers with hydroxy-terminated polybutad), R:$Bu_2Sn$ dilaurate, 75°C; 2 h, 75°C

**Notes**

Reactants: 4, Reagents: 2, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

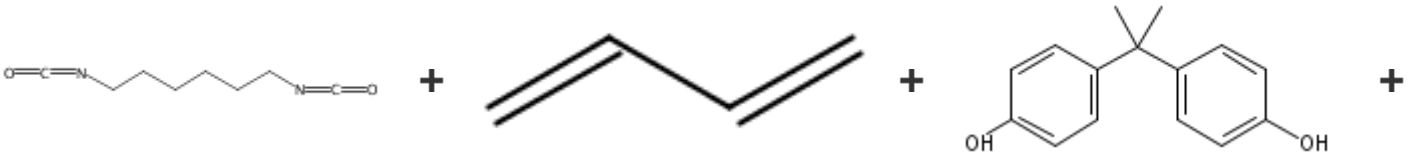
Ultraviolet light curing adhesive with good high and low-temperature impact resistance and excellent adhesion strength, and preparation method thereof

By Zhang, Hongming et al

From Faming Zhuanli Shenqing, 103819681, 28 May 2014



**26. Single Step**



hydroxy-terminated

Overview

**Steps/Stages**

**Notes**

1.1 1 h, 60°C → 100°C
1.2 S:DMSO, 100°C

Reactants: 4, Solvents: 1, Steps: 1, Stages: 2, Most stages in any one step: 2

**References**

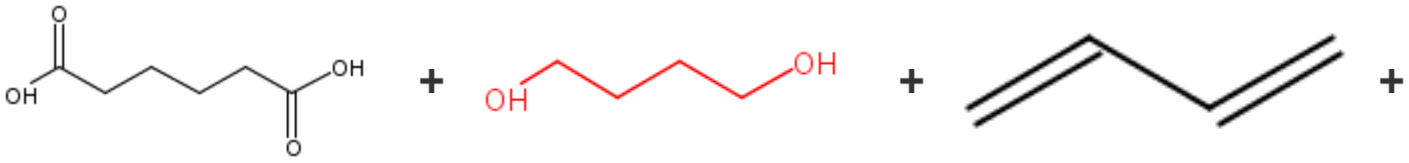
Synthesis and characterization of polyurethane based on aliphatic diisocyanate and stiff chain extenders

By Zuber, Mohammad et al

From Korean Journal of Chemical Engineering, 32(1), 184-190; 2015



**27. Single Step**




polymers with hydroxy-terminated polybutad

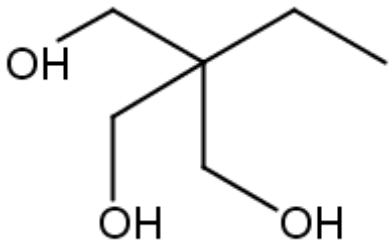
polymers with hydroxy-terminated polybutad

reaction products with dipentaerythritol p

Overview

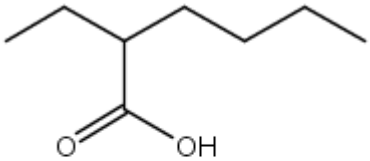
**Steps/Stages**

1.1 R:




(polymers with hydroxy-terminated polybutad)

R:




• 1/2 Sn(II)

80°C; 4 h, 80°C

**Notes**

Reactants: 4, Reagents: 2, Steps: 1, Stages: 1, Most stages in any one step: 1

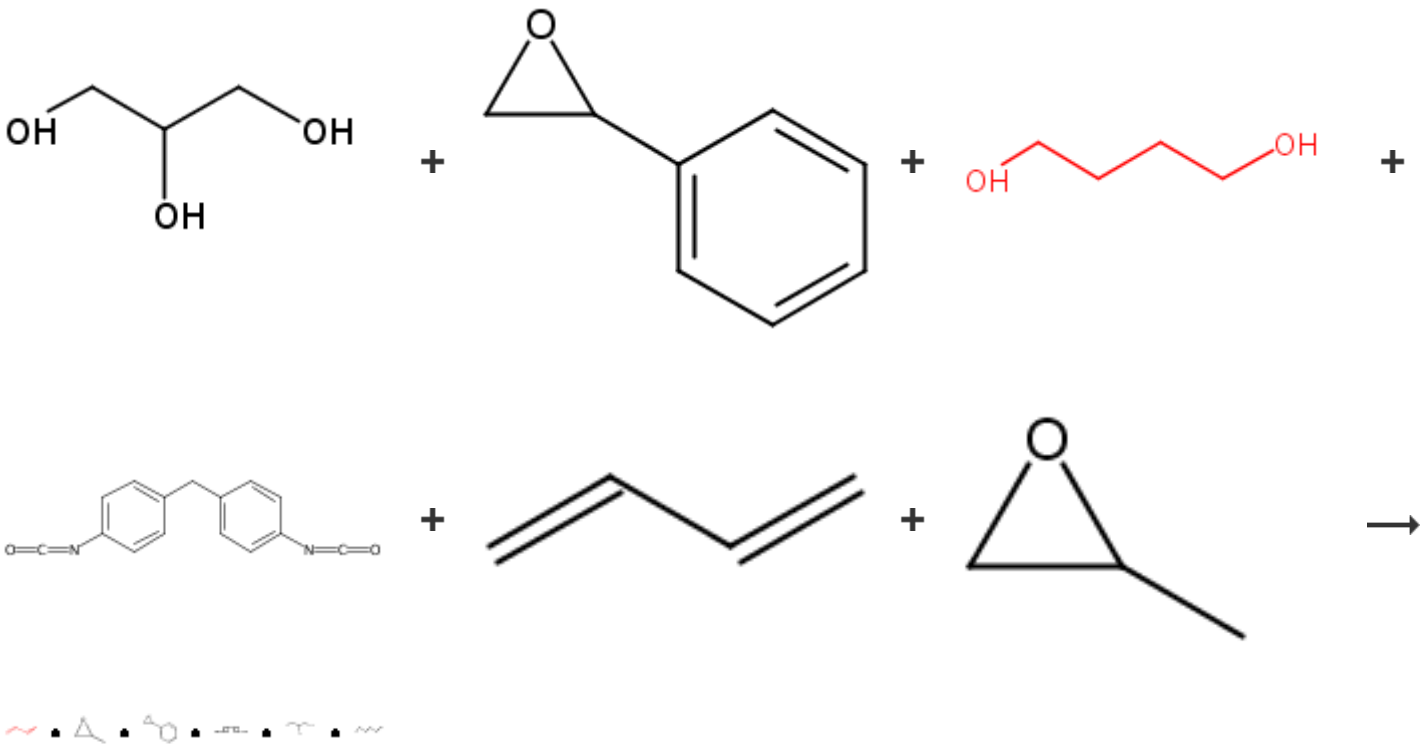
**References**

Ultraviolet light curing adhesive with good high and low-temperature impact resistance and excellent adhesion strength, and preparation method thereof

By Zhang, Hongming et al

From Faming Zhuanli Shenqing, 103819681, 28 May 2014

**28. Single Step**

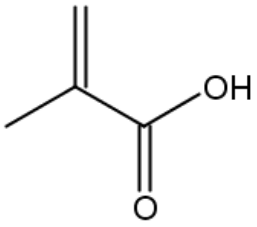


Overview

**Steps/Stages**

1.1 R:$TiO_2$

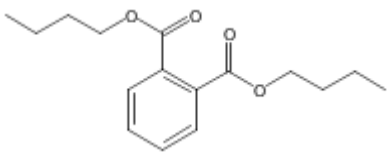
R:



- Na

30 min, rt → 30°C

1.2 R:



R:ZnO, R:(*t*-Bu-O)$_2$, 10 min, 30°C → 40°C

**Notes**

TREE and wax used, alternative reaction conditions shown, Reactants: 6, Reagents: 5, Steps: 1, Stages: 2, Most stages in any one step: 2

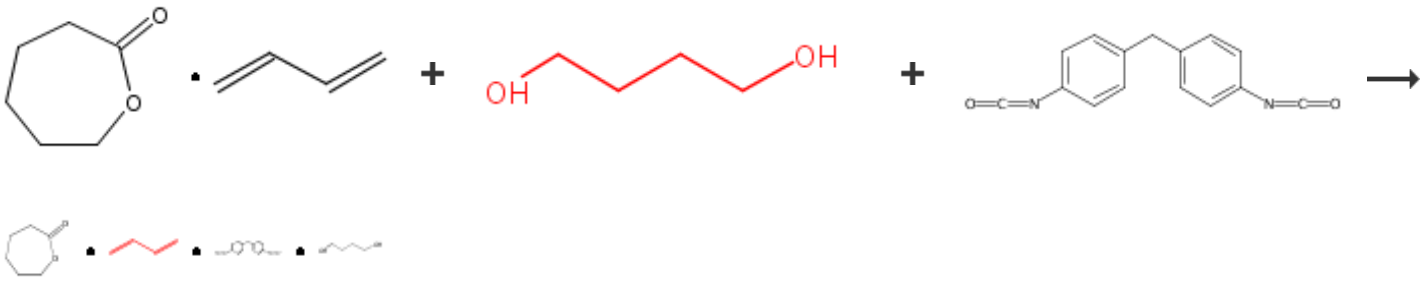
**References**

A polyester elastomer for golf and its preparation method

By Zhao, Huan

From Faming Zhuanli Shenqing, 104231216, 24 Dec 2014

**29. Single Step**




Overview

**Steps/Stages**

1.1 2 h, 70°C
1.2 70°C; 70°C → 80°C; 15 h, 80°C

**Notes**

15 hour curing was carried out in aluminum shell in stage 2, Reactants: 3, Steps: 1, Stages: 2, Most stages in any one step: 2

**References**

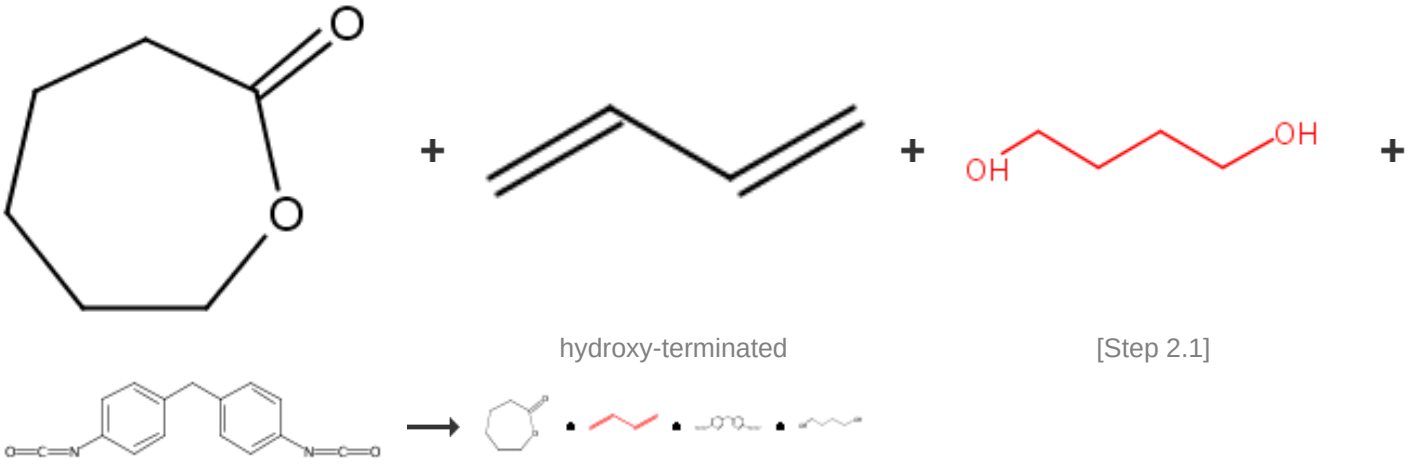
Polyester-modified polybutadienols for producing polyurethane elastomers and thermoplastic polyurethanes

By Eling, Berend et al

From PCT Int. Appl., 2016026807, 25 Feb 2016



**30. 2 Steps**




hydroxy-terminated

[Step 2.1]

[Step 2.2]

Overview

**Steps/Stages**

**Notes**

1.1 C:Ti(OBu)$_4$, 4 h, 150°C
2.1 2 h, 70°C
2.2 70°C; 70°C → 80°C; 15 h, 80°C

1) reaction in a sealed steel reactor, alternative preparation shown, alternate reaction conditions also shown, 2) 15 hour curing was carried out in aluminum shell in stage 2, Reactants: 4, Catalysts: 1, Steps: 2, Stages: 3, Most stages in any one step: 2

**References**

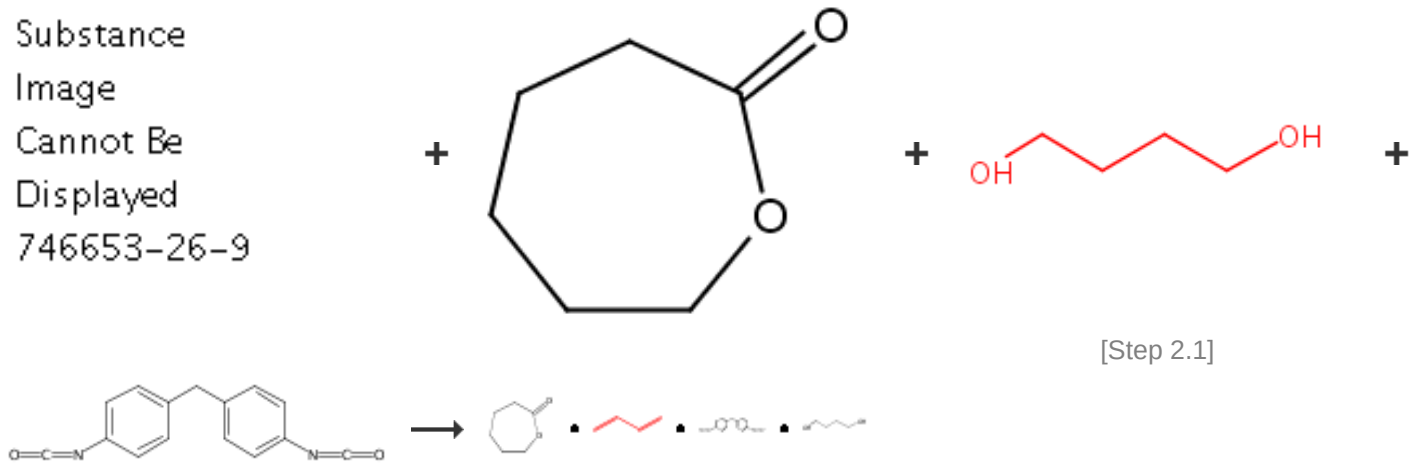
Polyester-modified polybutadienols for producing polyurethane elastomers and thermoplastic polyurethanes

By Eling, Berend et al

From PCT Int. Appl., 2016026807, 25 Feb 2016



**31. 2 Steps**




[Step 2.1]

[Step 2.2]

Overview

**Steps/Stages**

1.1 C:Ti(OBu)$_4$, 2 h, 120°C
2.1 2 h, 70°C
2.2 70°C; 70°C → 80°C; 15 h, 80°C

**Notes**

1) reaction in a sealed glass reactor, alternative preparation shown, alternate reaction conditions also shown, 2) 15 hour curing was carried out in aluminum shell in stage 2, Reactants: 4, Catalysts: 1, Steps: 2, Stages: 3, Most stages in any one step: 2

**References**

Polyester-modified polybutadienols for producing polyurethane elastomers and thermoplastic polyurethanes

By Eling, Berend et al

From PCT Int. Appl., 2016026807, 25 Feb 2016



**32. 2 Steps**

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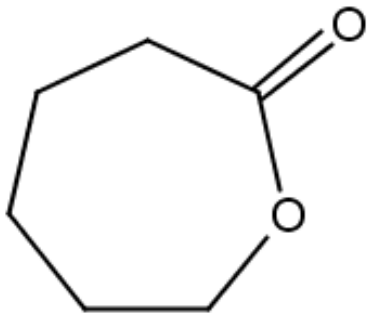


[Step 2.1]

[Step 2.2]

Overview

**Steps/Stages**

1.1 C:Ti(OBu)$_4$, 2 h, 120°C
2.1 2 h, 70°C
2.2 70°C; 70°C → 80°C; 15 h, 80°C

**Notes**

1) reaction in a sealed glass reactor, alternative preparation shown, alternate reaction conditions also shown, 2) 15 hour curing was carried out in aluminum shell in stage 2, Reactants: 4, Catalysts: 1, Steps: 2, Stages: 3, Most stages in any one step: 2

**References**

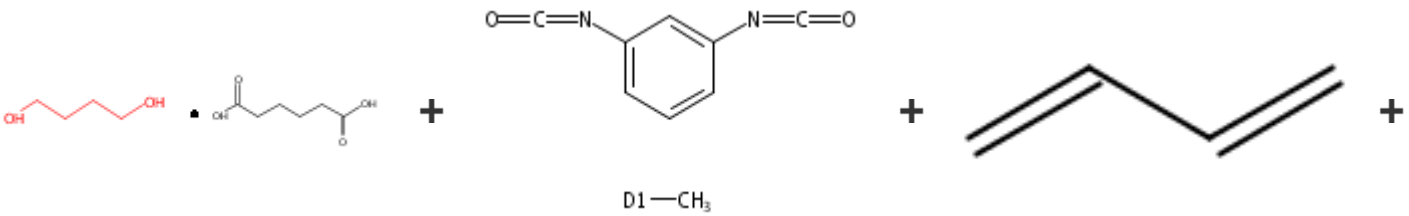
Polyester-modified polybutadienols for producing polyurethane elastomers and thermoplastic polyurethanes

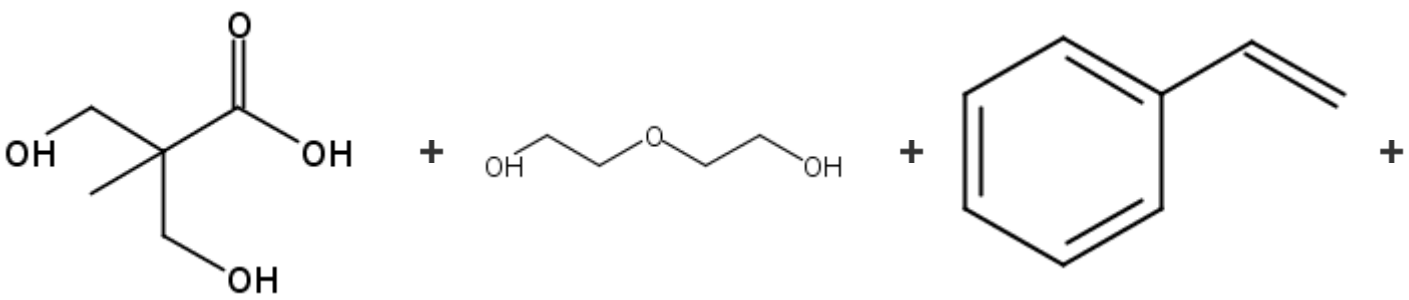
By Eling, Berend et al

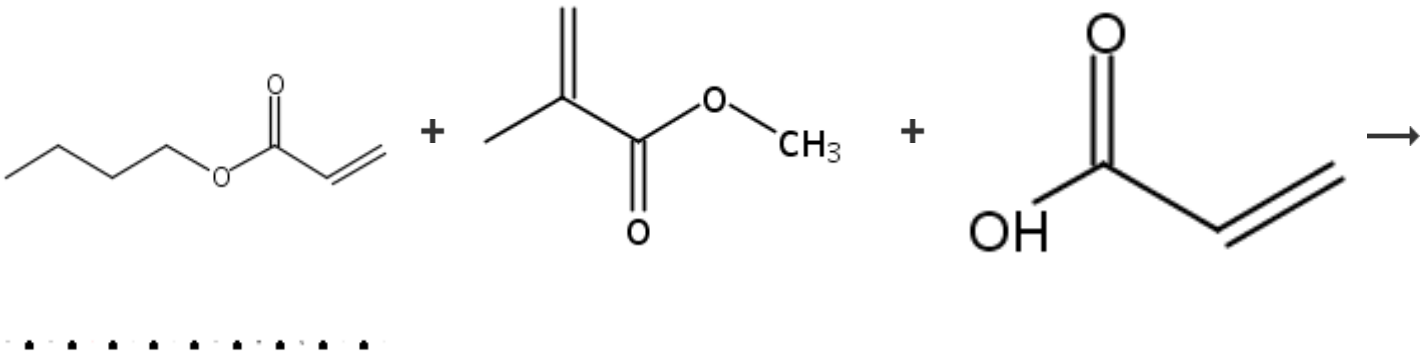
From PCT Int. Appl., 2016026807, 25 Feb 2016



**33. Single Step**







Overview

**Steps/Stages**

1.1 1 h, 90°C
1.2 C:301-10-0, C:$Bu_2Sn$ dilaurate, 3.5 h, 50°C → 60°C
1.3 R:$Et_3N$, C:AIBN, cooled; 1 min, cooled
1.4 R:$H_2NCH_2CH_2NH_2$ (polymers), S:$H_2O$, 2 min, 15°C; 20 h, 15°C; 1.5 h, 15°C → 85°C; 2 h, 85°C
1.5 C:$(NH_4)_2S_2O_8$, S:$H_2O$, 40 min, 85°C; 1.5 h, 85°C

**Notes**

Reactants: 9, Reagents: 2, Catalysts: 4, Solvents: 1, Steps: 1, Stages: 5, Most stages in any one step: 5

**References**

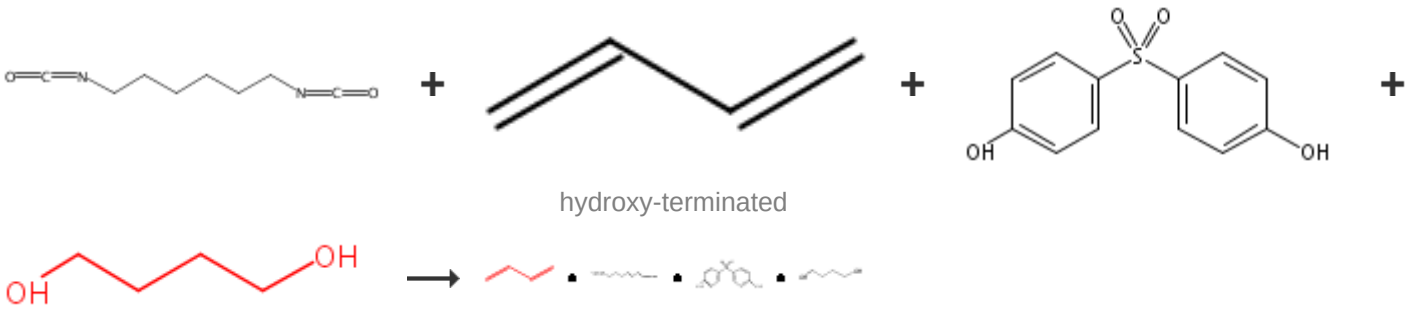
Preparation of polybutadiene-modified polyurethane-acrylate emulsion

By Gao, Mingzhi

From Faming Zhuanli Shenqing, 105037641, 11 Nov 2015



**34. Single Step**




Overview

**Steps/Stages**

1.1 1 h, 60°C → 100°C
1.2 S:DMSO, 100°C

**Notes**

Reactants: 4, Solvents: 1, Steps: 1, Stages: 2, Most stages in any one step: 2

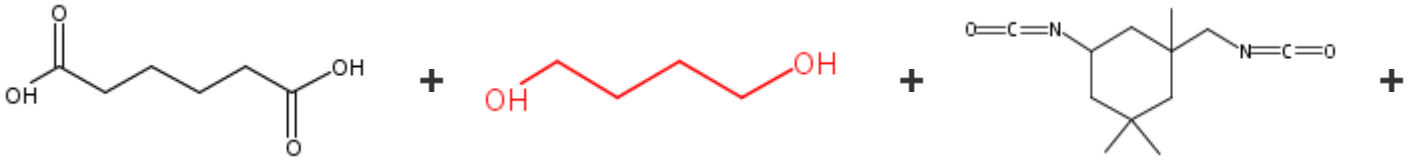
**References**

Synthesis and characterization of polyurethane based on aliphatic diisocyanate and stiff chain extenders

By Zuber, Mohammad et al

From Korean Journal of Chemical Engineering, 32(1), 184-190; 2015

**35. Single Step**



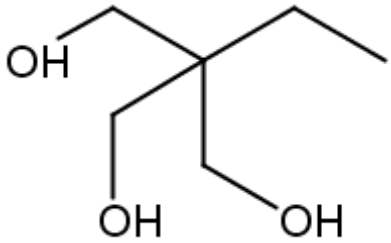
polymers with hydroxy-terminated polybutad | polymers with hydroxy-terminated polybutad | polymers with hydroxy-terminated polybutad

reaction products with trimethylolpropane

Overview

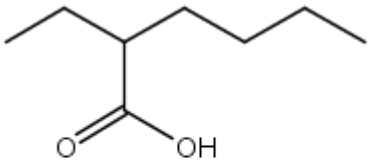
**Steps/Stages**

1.1 R:



(polymers with hydroxy-terminated polybutad)

R:



• 1/2 Sn(II)

78°C; 3 h, 78°C

**Notes**

Reactants: 4, Reagents: 2, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

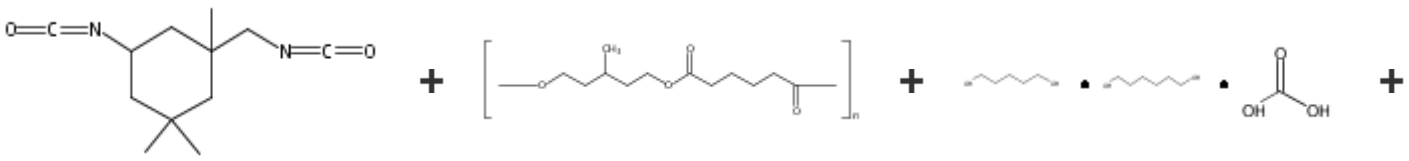
Ultraviolet light curing adhesive with good high and low-temperature impact resistance and excellent adhesion strength, and preparation method thereof

By Zhang, Hongming et al

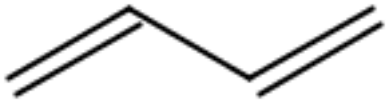
From Faming Zhuanli Shenqing, 103819681, 28 May 2014



**36. Single Step**



polymers with polyols



of 1,2-configuration, hydroxy-terminated

+

polymers with polyols and polyisocyanates


→

polymers with polyols and polyisocyanates



Overview

**Steps/Stages**

1.1 C:17501-44-9, C:MeC(=O)$CH_2$C(=O)Me, C:35948-25-5, C:$TiO_2$, S:123-86-4

**Notes**

Reactants: 5, Catalysts: 4, Solvents: 1, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

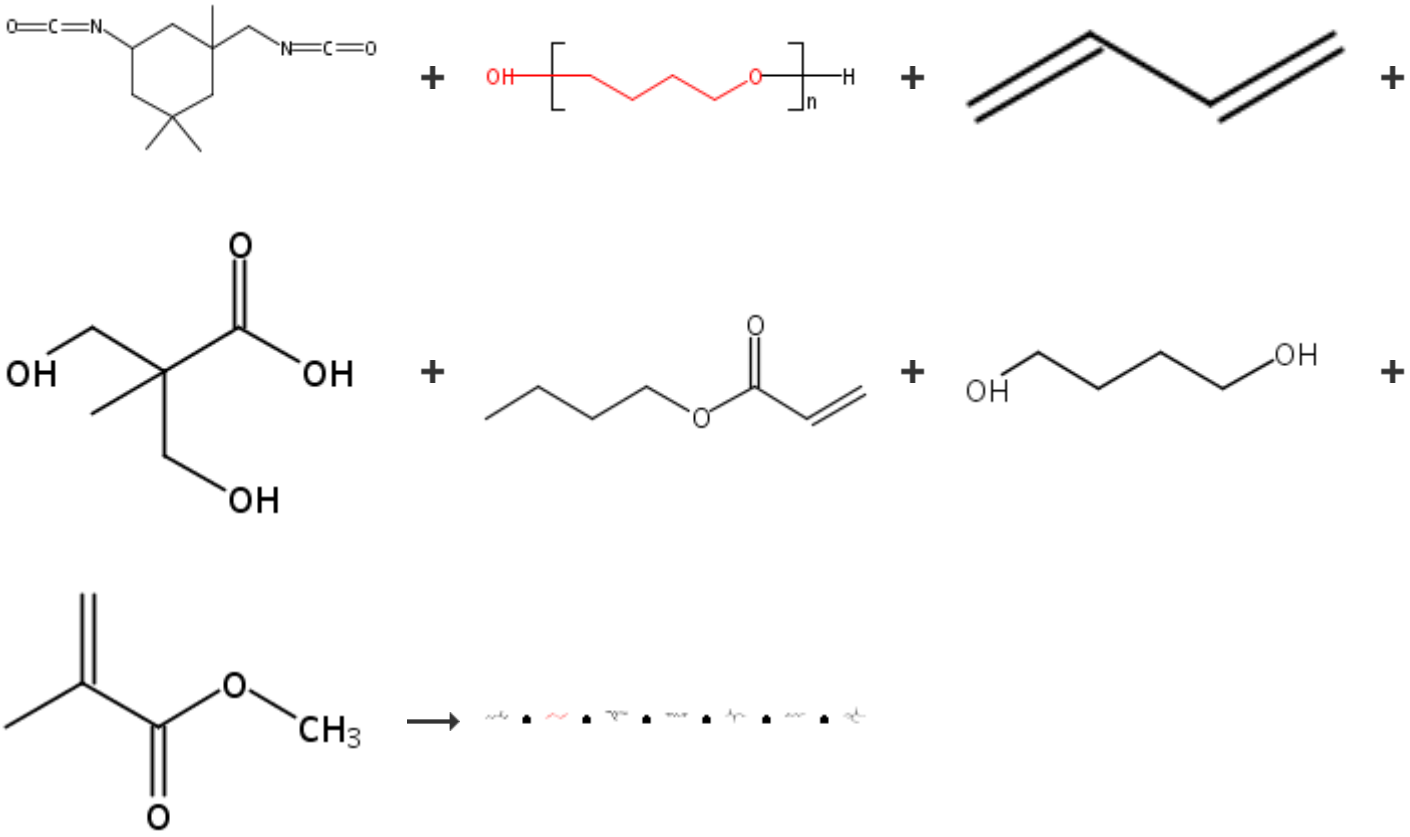
Resin compositions with good discoloration resistance and reactivity and long pot life

By Yamaguchi, Kaoru et al

From Jpn. Kokai Tokkyo Koho, 2013199582, 03 Oct 2013



**37. Single Step**




Overview

**Steps/Stages**

**Notes**

1.1 1.5 h, 90°C; 90°C → 50°C
1.2 C:301-10-0, C:$Bu_2Sn$ dilaurate, 3.5 h, 50°C → 60°C
1.3 R:$Et_3N$, C:AIBN, cooled; 1 min, cooled
1.4 R:$H_2NCH_2CH_2NH_2$ (polymers), S:$H_2O$, 2 min, 15°C; 20 h, 15°C; 1.5 h, 15°C → 85°C; 2 h, 85°C
1.5 C:$(NH_4)_2S_2O_8$, S:$H_2O$, 40 min, 85°C; 1.5 h, 85°C

Reactants: 7, Reagents: 2, Catalysts: 4, Solvents: 1, Steps: 1, Stages: 5, Most stages in any one step: 5

**References**

Preparation of polybutadiene-modified polyurethane-acrylate emulsion

By Gao, Mingzhi

From Faming Zhuanli Shenqing, 105037641, 11 Nov 2015



**38. Single Step**

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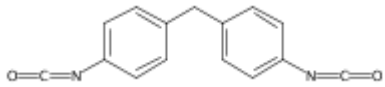
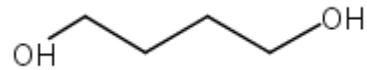
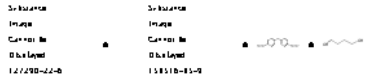


Substance Image Cannot Be Displayed 158516-85-9

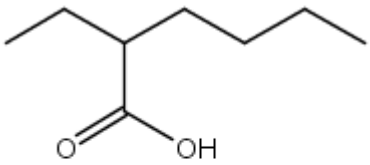




Overview

**Steps/Stages**

1.1 R:



• 1/2 Sn(II)

rt → 120°C
1.2 2 min, 120°C
1.3 2 min, 120°C

**Notes**

Reactants: 3, Reagents: 1, Steps: 1, Stages: 3, Most stages in any one step: 3

**References**

Compatibilized blends of a thermoplastic elastomer and a polyolefin

By Farkas, Julius et al

From PCT Int. Appl., 9919406, 22 Apr 1999



**39. Single Step**

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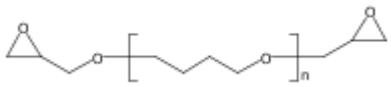
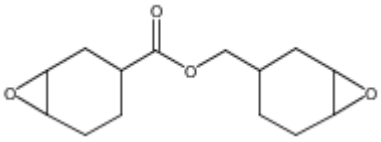


+



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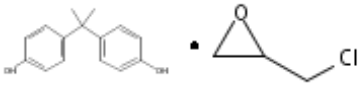

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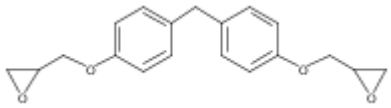

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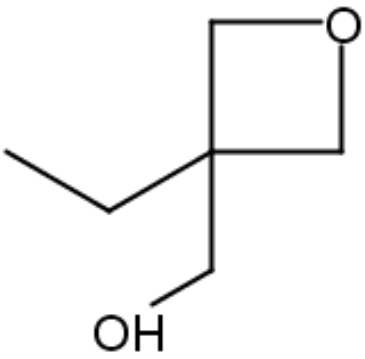
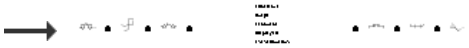
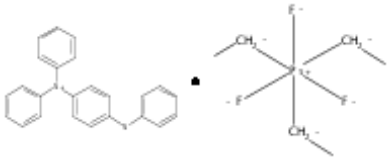


Overview

**Steps/Stages** **Notes**

1.1 R:



R:

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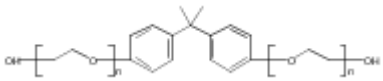
R:



C:947-19-3, C:$H_2O$, 3 h, 60°C

Reactants: 7, Reagents: 3, Catalysts: 2, Steps: 1, Stages: 1, Most stages in any one step: 1

**References**

Radiation-curable compositions and method for manufacturing three-dimensional articles with high transparency and high toughness therefrom

By Takase, Katsuyuki et al

From Jpn. Kokai Tokkyo Koho, 2013166893, 29 Aug 2013