

wherein the composition is useful as a catalyst for polymerizing epoxides.

7. The composition of claim 6 which comprises at least about 90 wt. % of the substantially amorphous DMC complex catalyst, and up to about 10 wt. % of the highly crystalline DMC compound.

8. The composition of claim 6 which comprises at least about 99 wt. % of the substantially amorphous DMC complex catalyst, and up to about 1 wt. % of the highly crystalline DMC compound.

9. A catalyst which consists essentially of a substantially amorphous double metal cyanide complex useful for polymerizing epoxides.

10. The catalyst of claim 9 which contains less than about 1 wt. % of a highly crystalline DMC compound.

11. The catalyst of claim 9 having a surface area less than about 30 m²/g.

12. The catalyst of claim 9 wherein the DMC complex is a zinc hexacyanocobaltate.

13. The catalyst of claim 12 prepared using tert-butyl alcohol as a complexing agent.

14. A method of making a double metal cyanide (DMC) complex catalyst, said method comprising: (a) intimately combining and reacting aqueous solutions of a water-soluble metal salt and a water-soluble metal cyanide salt in the presence of a complexing agent to produce an aqueous mixture containing a precipitated DMC complex catalyst; and (b) isolating and drying the DMC complex catalyst.

15. The method of claim 14 wherein the resulting catalyst further comprises up to about 30 wt. % of a highly crystalline DMC compound.

16. The method of claim 14 wherein the resulting catalyst has a surface area less than about 30 m²/g.

17. The method of claim 14 wherein the aqueous salt solutions are intimately combined by a homogenization process.

18. The method of claim 14 wherein the complexing agent is selected from the group consisting of alcohols, aldehydes, ketones, ethers, esters, amides, ureas, nitriles, sulfides, and mixtures thereof.

19. The method of claim 14 wherein the complexing agent is a water-soluble aliphatic alcohol selected from the group consisting of ethanol, isopropyl alcohol, n-butyl alcohol, sec-butyl alcohol, tert-butyl alcohol, isobutyl alcohol, and mixtures thereof.

20. The method of claim 14 wherein the resulting catalyst prepared by intimately combining the reactants is at least about 65% more active as an epoxide polymerization catalyst than a similar catalyst prepared by simple mixing of the reactants.

21. The method of claim 14 wherein the resulting catalyst prepared by intimately combining the reactants is at least about 200% more active as an epoxide polymerization catalyst than a similar catalyst prepared by simple mixing of the reactants.

22. A DMC complex catalyst made by the method of claim 14.

23. A catalyst which consists essentially of a substantially amorphous zinc hexacyanocobaltate complex, wherein the catalyst is prepared in the presence of a water-soluble aliphatic alcohol complexing agent selected from the group consisting of ethanol, isopropyl alcohol, tert-butyl alcohol, sec-butyl alcohol, n-butyl alcohol, and isobutyl alcohol.

24. The catalyst of claim 23 which exhibits an X-ray diffraction pattern of (d-spacing, angstroms): 4.82 (br), 3.76 (br), and exhibits no detectable signals corresponding to highly crystalline zinc hexacyanocobaltate at about (d-spacing, angstroms): 5.07, 3.59, 2.54, 2.28.

25. A double metal cyanide complex catalyst having a surface area less than about 30 m²/g.

26. The catalyst of claim 25 having a surface area less than about 20 m²/g.

27. A double metal cyanide catalyst which is the reaction product of a water-soluble metal salt, a water-soluble metal cyanide salt, and a complexing agent, wherein the catalyst is effective to polymerize propylene oxide at a rate in excess of 3 g PO/min/100 ppm catalyst, based on the weight of finished polyether, at 105° C.

28. A double metal cyanide catalyst which is the reaction product of a water-soluble metal salt, a water-soluble metal cyanide salt, and a complexing agent, wherein the catalyst is effective to polymerize propylene oxide at a rate in excess of 5 g PO/min/250 ppm catalyst, based on the weight of finished polyether, at 105° C.

29. The catalyst of claim 1 wherein the substantially amorphous DMC complex exhibits a powder x-ray diffraction pattern having substantially no sharp lines at about 5.1 (d-spacing, angstroms).

30. The method of claim 14 wherein the resulting catalyst exhibits a powder x-ray diffraction pattern having substantially no sharp lines at about 5.1 (d-spacing, angstroms).

31. The catalyst of claim 23 wherein the substantially amorphous zinc hexacyanocobaltate complex exhibits a powder x-ray diffraction pattern having substantially no sharp lines at about 5.1 (d-spacing, angstroms).

32. A double metal cyanide (DMC) complex catalyst that exhibits a powder x-ray diffraction pattern having substantially no sharp lines at about 5.1 (d-spacing, angstroms).

33. A DMC catalyst which comprises at least about 70 wt. % of the catalyst of claim 32.

34. The catalyst of claim 32 having a surface area less than about 30 m²/g.

35. The method of claim 20 wherein the DMC complex catalyst is a zinc hexacyanocobaltate, and the activity of the catalyst is measured for the polymerization of propylene oxide at 105° C. using a catalyst level of 100 ppm based on the weight of finished polyol.

36. The method of claim 21 wherein the DMC complex catalyst is a zinc hexacyanocobaltate, and the activity of the catalyst is measured for the polymerization of propylene oxide at 105° C. using a catalyst level of 250 ppm in the finished polyol.

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