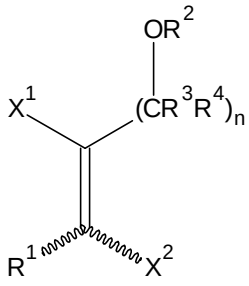
CLAIMS

We claim:

1. A polyurethane comprising a compound of Formula 1,



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wherein

X^1 and X^2 are each independently H, Cl, or Br, and at least one of X^1 or X^2 is Br;

R^1 is H, Cl, Br, C_1-C_4 alkyl, or $–(CR^5R^6)_m$-OR^7;

R^2 is H or C_2-C_8 alkylhydroxyl;

R^3, R^4, R^5 and R^6 are each independently H, C_1-C_8 alkyl, C_2-C_8 alkenyl, C_1-C_8 haloalkyl or C_2-C_8 haloalkenyl;

R^7 is H, C_1-C_8 alkyl, C_2-C_8 alkenyl, C_1-C_8 haloalkyl, C_2-C_8 haloalkenyl or C_2-C_8 alkylhydroxyl;

n=1-4;

m=1-4; and

the compound of Formula 1 is chemically bonded in the polyurethane foam through at least one hydroxyl group on the compound;

with the provisos that

when R^2 is C_2-C_8 alkylhydroxyl, R^7 cannot be C_2-C_8 alkylhydroxyl; or

when X^1 and X^2 are both Br and n=1, then the compound cannot be 2,3-dibromoallyl alcohol or 2,3-dibromo-butene-1,4-diol.

2. The polyurethane of Claim 1, wherein R^2 is H.

3. The polyurethane of Claim 1, wherein R^1 is H.

4. The polyurethane of Claim 1, wherein n is 1 and m, when present, is 1.

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5. The polyurethane of Claim 1, wherein X^1 is Br and X^2 is Cl or H.

6. The polyurethane of Claim 1, wherein X^1 is Br, X^2 is H, and R^1 is H.

7. The polyurethane of Claim 1, wherein X^1, X^2 and R^1 are each Br.

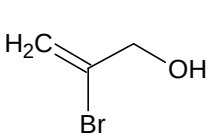
8. The polyurethane of Claim 1, wherein n is 2-4, and R^2 is H.

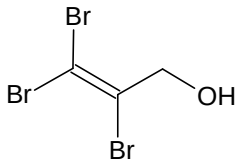
9. The polyurethane of Claim 1, wherein R^2 is a C_2 to C_8 alkylhydroxyl.

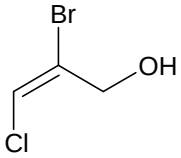
10. The polyurethane of Claim 1, wherein R^1 is H, and when one of X^1 and X^2 is Br, then the other is Cl.

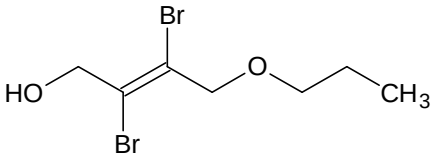
11. The polyurethane of Claim 1, wherein when one of X^1 and X^2 is Br, then the other is H.

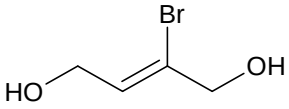
12. The polyurethane of Claim 1, wherein the compound is:



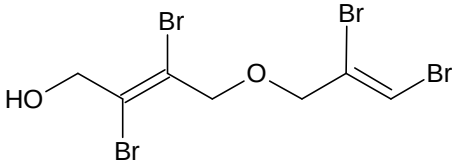






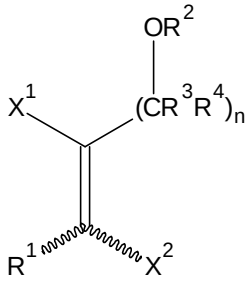


or



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13. A formulation comprising a compound of Formula I and at least one polyol, ,



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wherein

X^1 and X^2 are each independently H, Cl, or Br, and at least one of X^1 or X^2 is Br;

R^1 is H, Cl, Br, C_1-C4 alkyl, or $–(CR^5R^6)_m$-OR^7;

R^2 is H or C_2-C_8 alkylhydroxyl;

R^3, R^4, R^5 and R^6 are each independently H, C_1-C_8 alkyl, C_2-C_8 alkenyl, C_1-C_8 haloalkyl or C_2-C_8 haloalkenyl;

R^7 is H, C_1-C_8 alkyl, C_2-C_8 alkenyl, C_1-C_8 haloalkyl, C_2-C_8 haloalkenyl or C_2-C_8 alkylhydroxyl;

n=1-4; and

m=1-4;

with the provisos that

when R^2 is C_2-C_8 alkylhydroxyl, R^7 cannot be C_2-C_8 alkylhydroxyl; or

when X^1 and X^2 are both Br and n=1, then the compound cannot be 2,3-dibromoallyl alcohol or 2,3-dibromo-butene-1,4-diol.

14. The formulation of Claim 13, wherein R^2 is H.

15. The formulation of Claim 13, wherein R^1 is H.

16. The formulation of Claim 13, wherein n is 1 and m, when present, is 1.

17. The formulation of Claim 13, wherein X^1 is Br and X^2 is Cl or H.

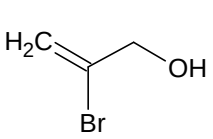
18. The formulation of Claim 13, wherein X^1 is Br, X^2 is H, and R^1 is H.

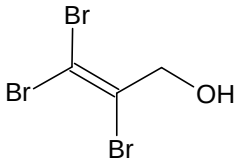
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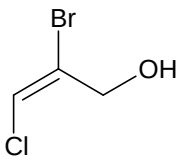
19. The formulation of Claim 13, wherein X^1, X^2 and R^1 are each Br.

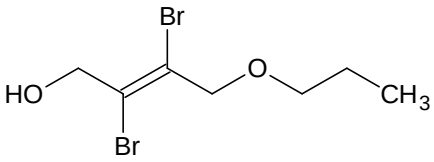
20. The formulation of Claim 13, wherein R^2 is a C_2 to C_4 hydroxyl.

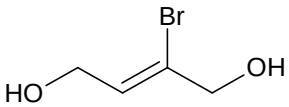
21. The formulation of Claim 13, wherein the compound is:



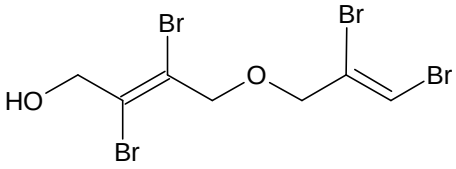








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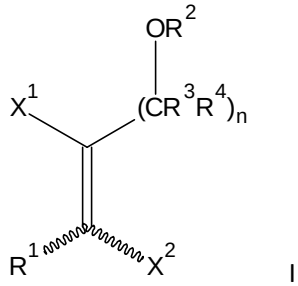
22. The formulation of Claim 13, further comprising a blowing agent.

23. A process for forming a polyurethane, the process comprising

contacting A) at least one isocyanate and/or polyisocyanate and B) a formulation comprising a compound of Formula 1 and at least one polyol; and

allowing the mixture to cure to form a polyurethane foam;

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wherein

X^1 and X^2 are each independently H, Cl, or Br, and at least one of X^1 or X^2 is Br;

R^1 is H, Cl, Br, C_1-C_4 alkyl, or $–(CR^5R^6)_m$-OR^7;

R^2 is H or C_2-C_8 alkylhydroxyl;

R^3, R^4, R^5 and R^6 are each independently H, C_1-C_8 alkyl, C_2-C_8 alkenyl, C_1-C_8 haloalkyl or C_2-C_8 haloalkenyl;

R^7 is H, C_1-C_8 alkyl, C_2-C_8 alkenyl, C_1-C_8 haloalkyl, C_2-C_8 haloalkenyl or C_2-C_8 alkylhydroxyl;

n=1-4; and

m=1-4;

with the provisos that

when R^2 is C_2-C_8 alkylhydroxyl, R^7 cannot be C_2-C_8 alkylhydroxyl; or

when X^1 and X^2 are both Br and n=1, then the compound cannot be 2,3-dibromoallyl alcohol or 2,3-dibromo-butene-1,4-diol.

24. The process of Claim 23, wherein R^2 is H.

25. The process of Claim 23, wherein R^1 is H.

26. The process of Claim 23, wherein n is 1 and m, when present, is 1.

27. The process of Claim 23, wherein X^1 is Br and X^2 is Cl or H.

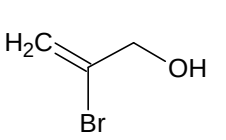
28. The process of Claim 23, wherein X^1 is Br, X^2 is H, and R^1 is H.

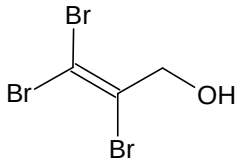
29. The process of Claim 23, wherein X^1, X^2 and R^1 are each Br.

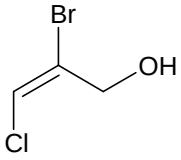
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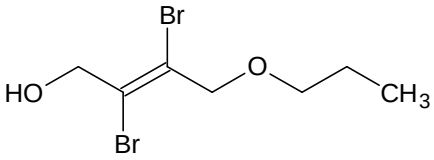
30. The process of Claim 23, wherein R^2 is a C_2 to C_4 hydroxyl.

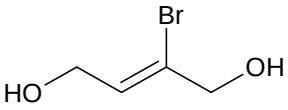
31. The process of Claim 23, wherein the compound is:



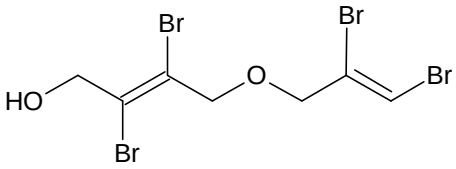








or



32. The process of Claim 23, wherein the process further comprises at least one blowing agent, at least one catalyst, and at least one surfactant in the (B) formulation with the compound of Formula 1 and the at least one polyol.

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