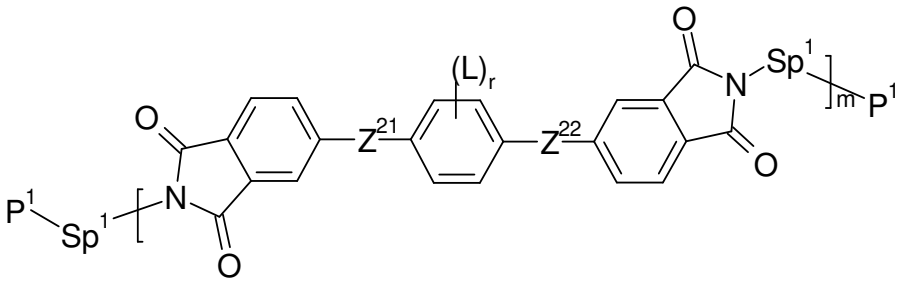
CLAIMS

1. A polymerizable mixture comprising:

a first monomer and a second monomer,

wherein the first monomer is one or more selected from formulae M1 to M31:

M1



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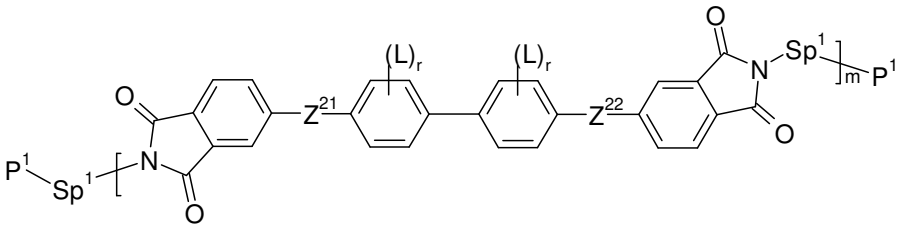

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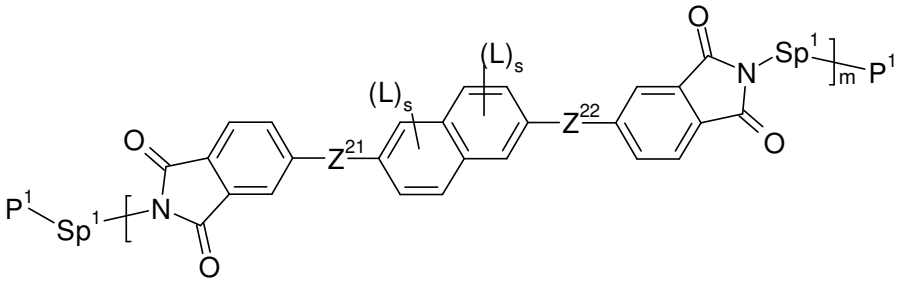

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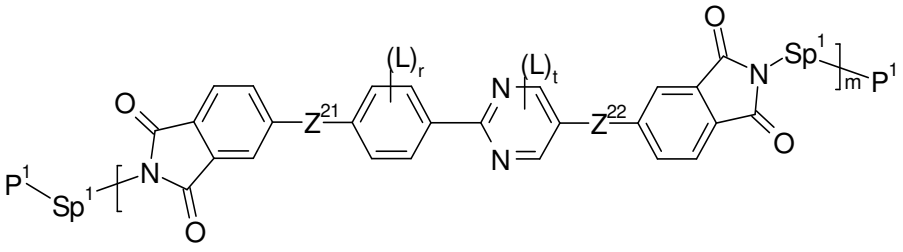

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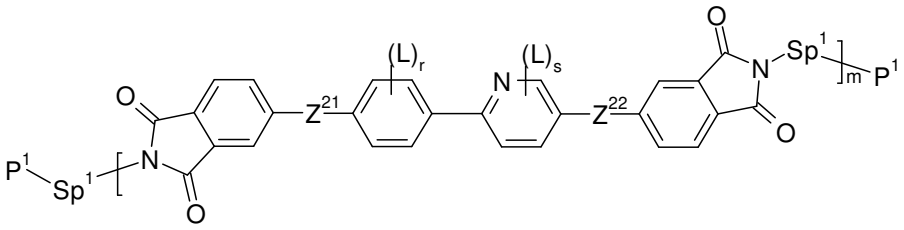

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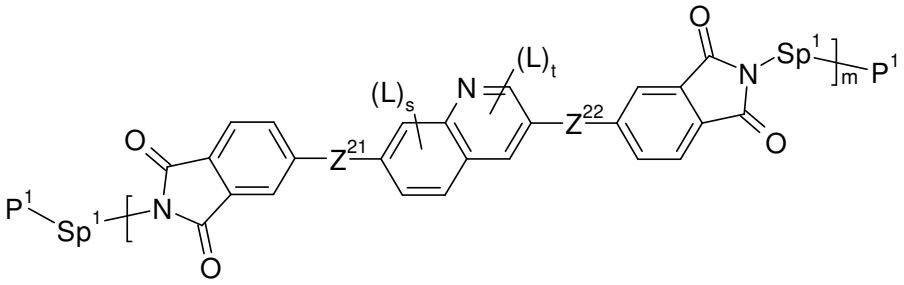

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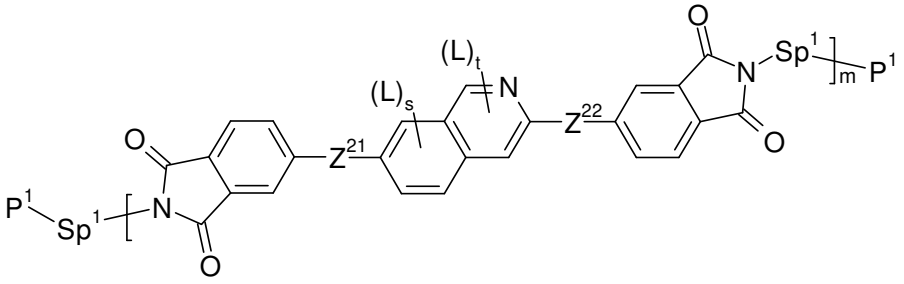

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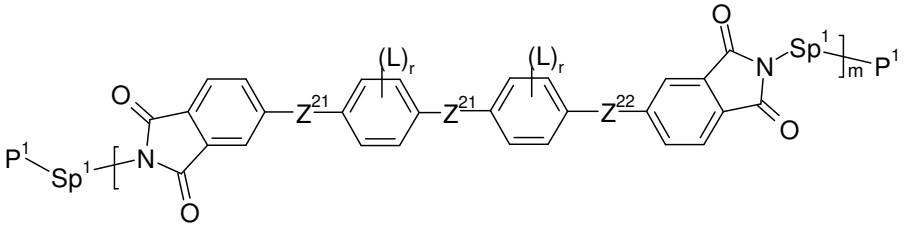

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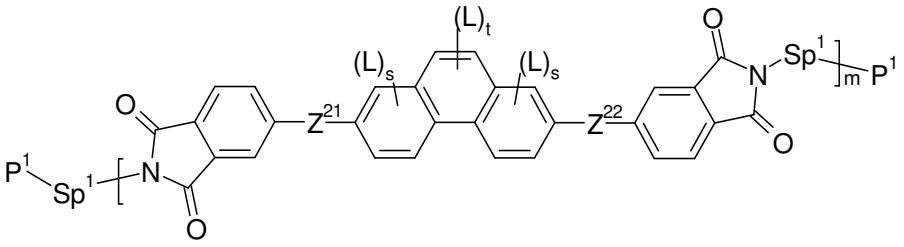

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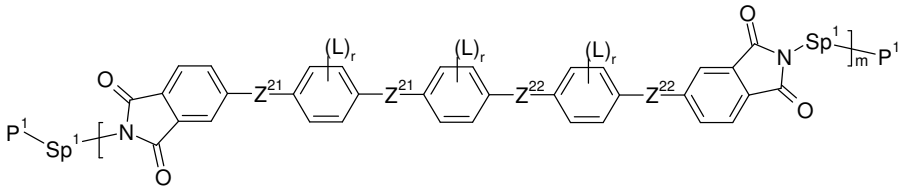

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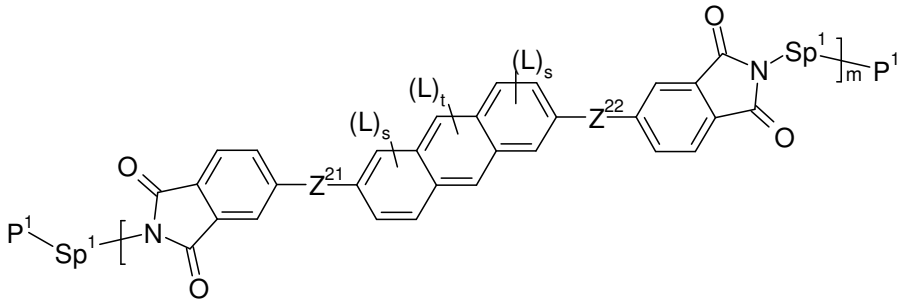

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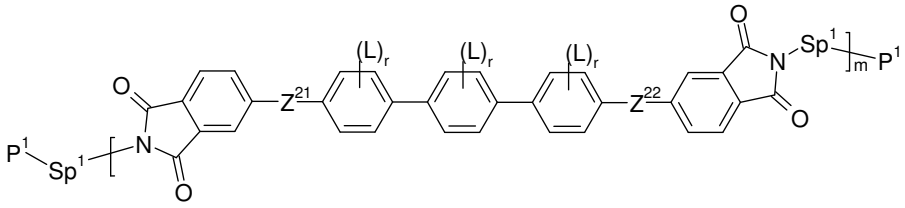

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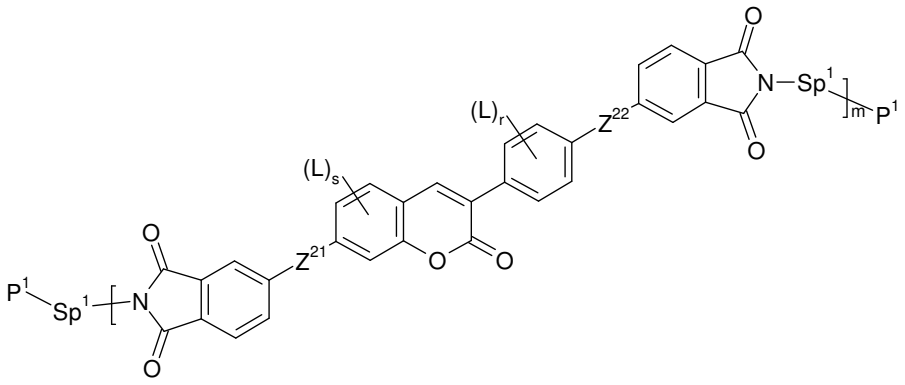

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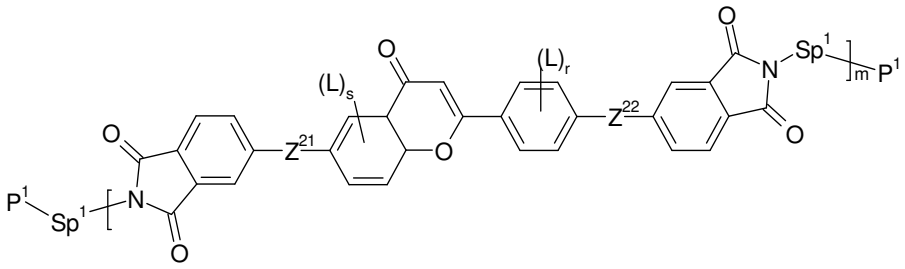

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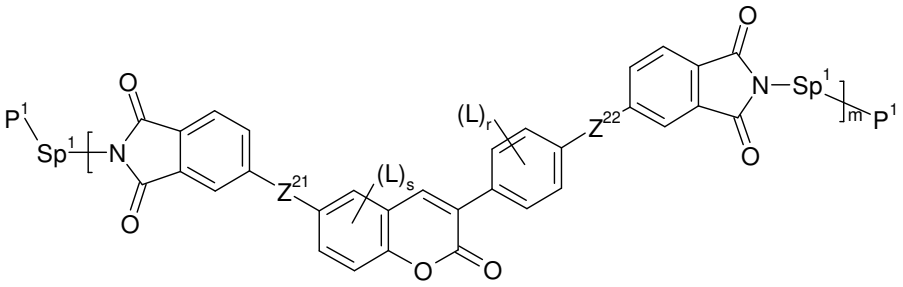

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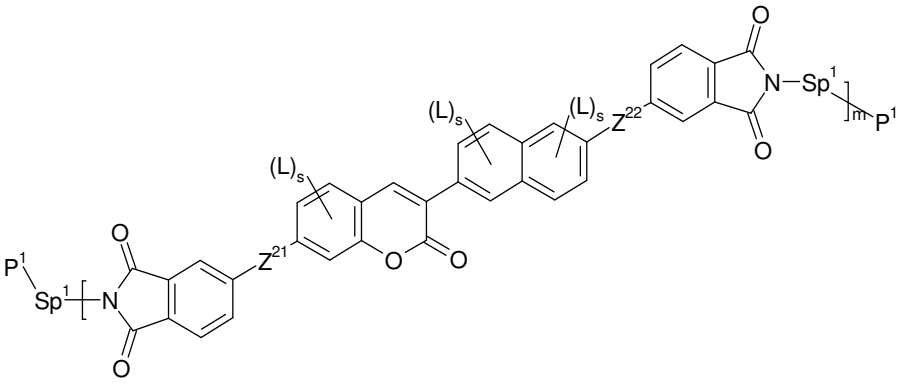

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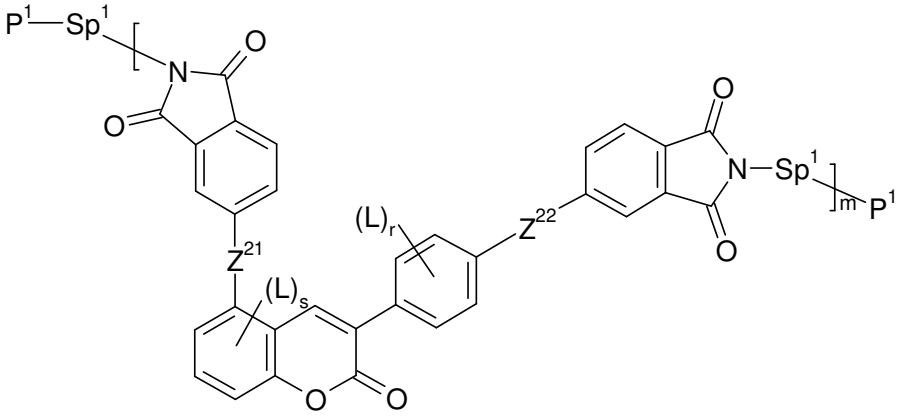

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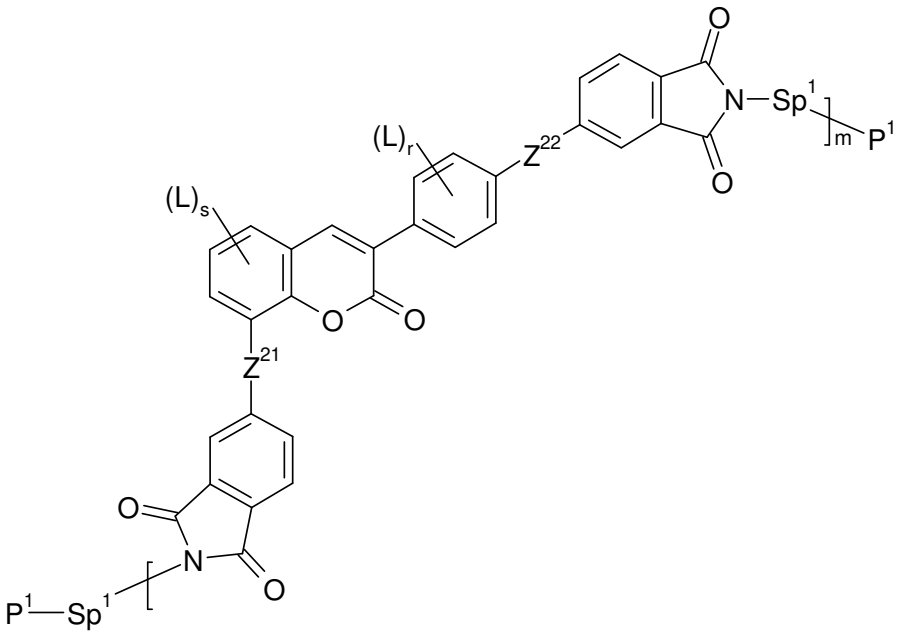

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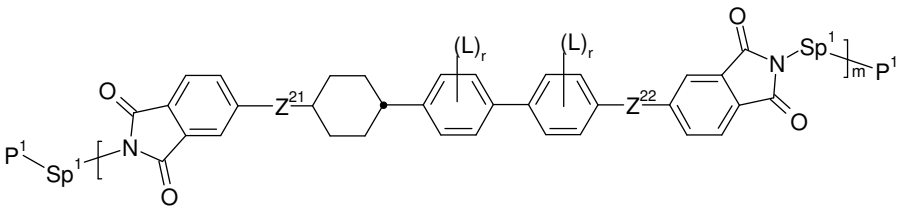

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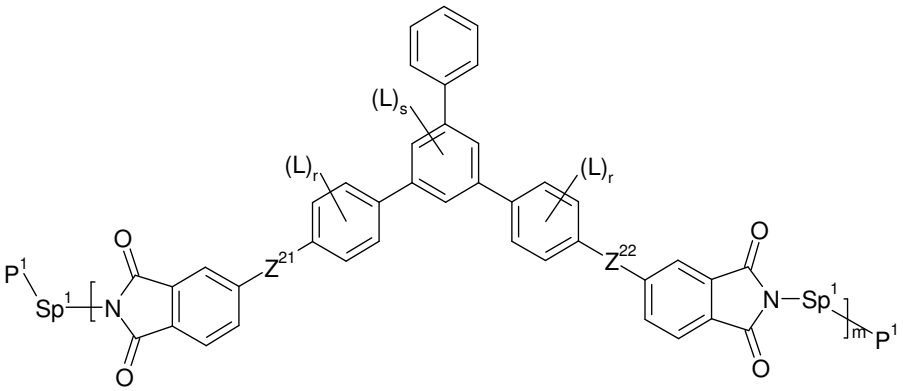

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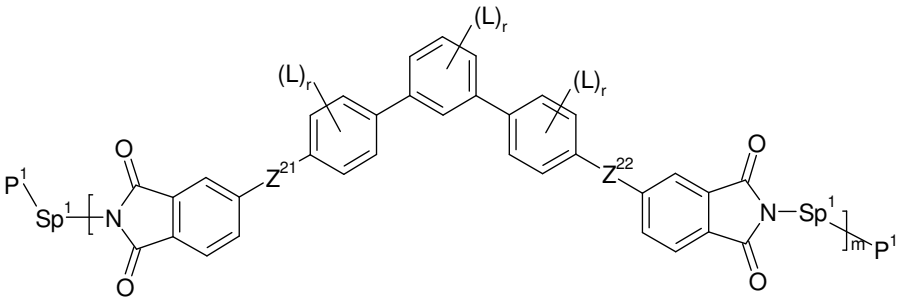

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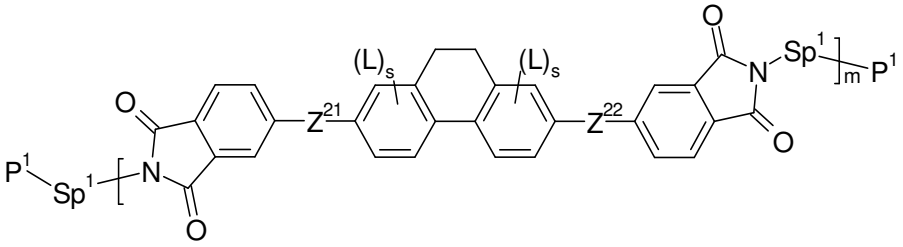

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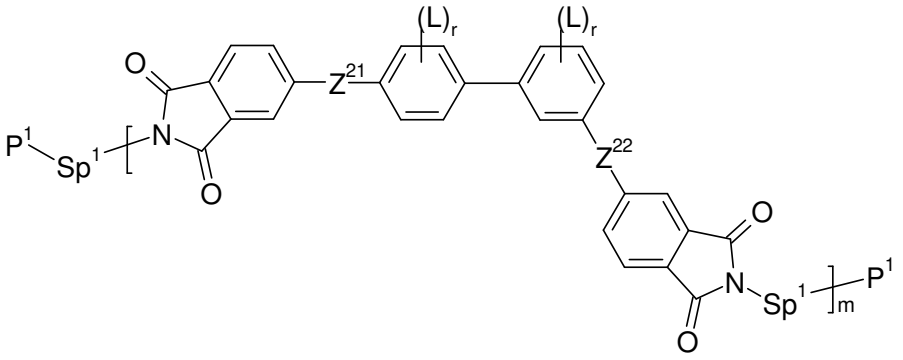

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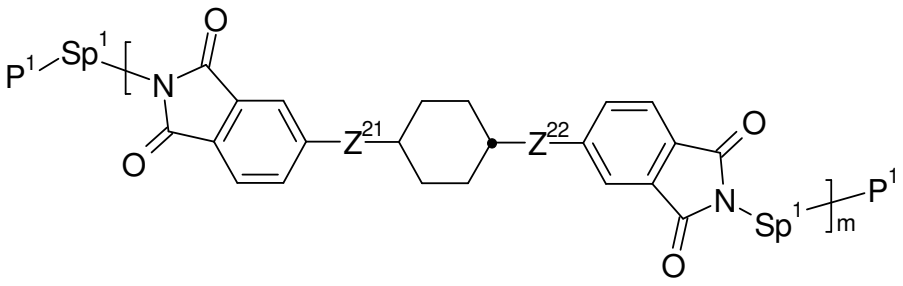

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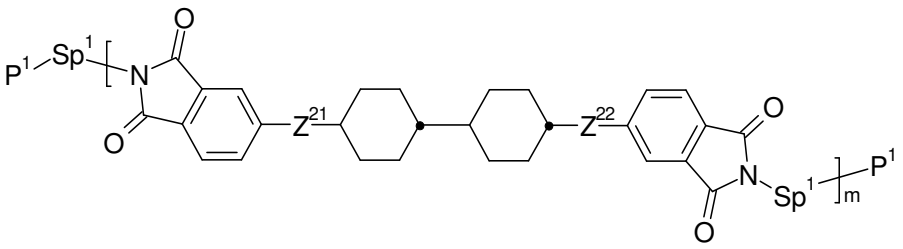

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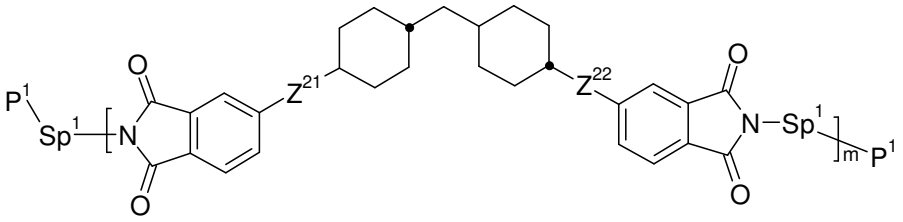

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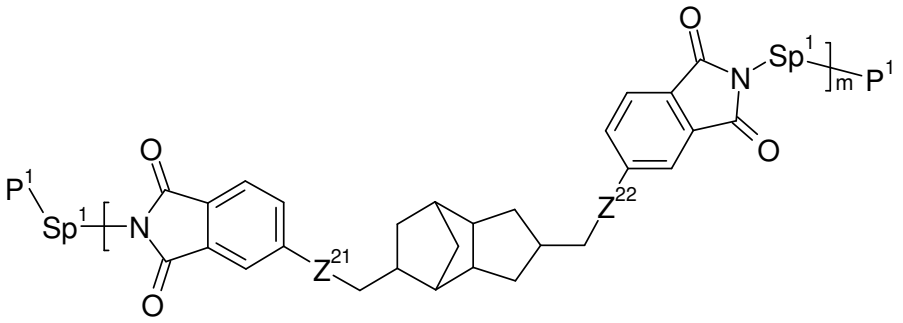

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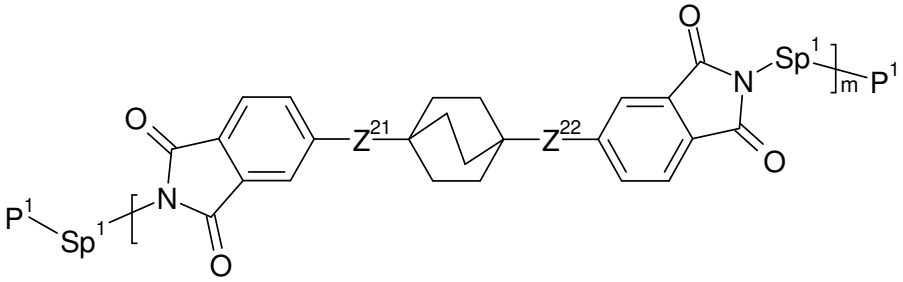

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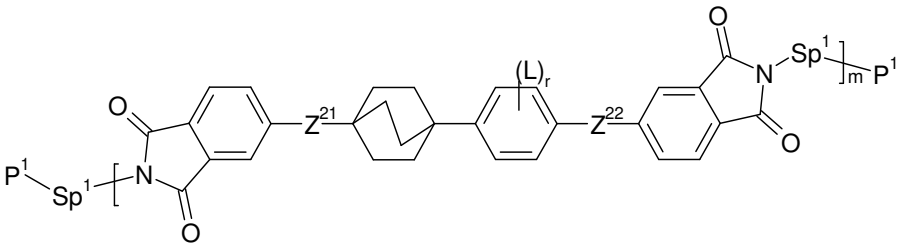

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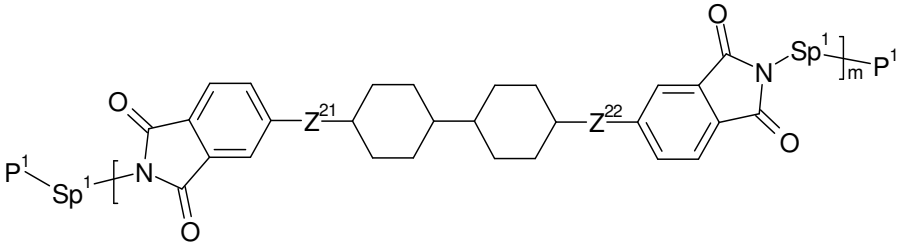
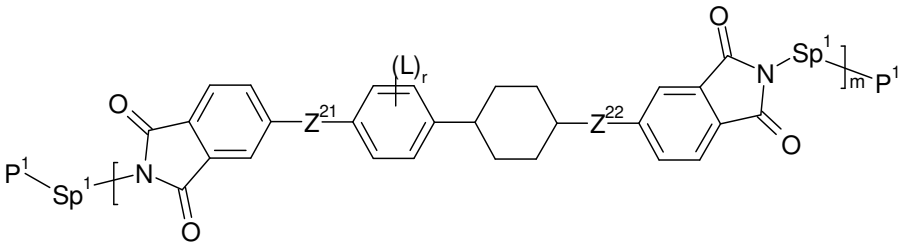
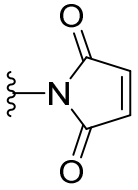




wherein:

m is an integer from 1 to 60;



P^1 denotes ;

Sp^1 denotes at each occurrence a spacer group Sp;

Z^{21} and Z^{22} are independently and at each occurrence independently from each other, -O-, -S-, -CO-, -COO-, -OCO-, -S-CO-, -CO-S-, -O-COO-, -CO-NR^{01}-, -NR^{01}-CO-, -NR^{01}-CO-NR^{02}, -NR^{01}-CO-O-, -O-CO-NR^{01}-, -OCH_2-, -CH_2O-, -SCH_2-, -CH_2S-, -CH_2CH_2-, -$(CH_2)_4$-, -CH=N-, -N=CH-, -N=N-, -CH=CR^{01}-, -CY^{01}=CY^{02}-, -C≡C-, -CH=CH-COO-, -OCO-CH=CH-, or a single bond;

R^{01} and R^{02} each, independently of one another, denote H or alkyl having 1 to 12 C atoms;

L is Cl, Br, I, -CN, -NO_2, -NCO, -NCS, -OCN, -SCN, -C(=O)$NR^{xx}R^{yy}$, -C(=O)OR^{xx}, -C(=O)R^{xx}, -$NR^{xx}R^{yy}$, -OH, -SF_5, straight chain alkyl or alkoxy having 1 to 20 C atoms, branched chain alkyl or alkoxy having 3 to 20 C atoms, straight chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy, or alkoxycarbonyloxy with 2 to 20 C atoms, or branched chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy, or alkoxycarbonyloxy having 4 to 20 C atoms wherein, in said alkyl, alkoxy, alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy, or alkoxycarbonyloxy groups, one or more H atoms are each optionally replaced by F, Cl, -CN, straight chain alkyl or alkoxy having 1 to 6 C atoms, branched chain alkyl or alkoxy having 3 to 6 C atoms, straight chain alkylcarbonyl, alkoxycarbonyl,

alkylcarbonyloxy, or alkoxycarbonyloxy with 2 to 6 C atoms, or branched chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy, or alkoxycarbonyloxy with 4 to 6 C atoms;

R^{xx} and R^{yy} independently of each other denote H or alkyl with 1 to 12 C-atoms;

Y^{01} and Y^{02} each, independently of one another, denote H, alkyl having 1 to 12 C atoms, aryl, Cl, or CN;

r is 0, 1, 2, 3 or 4;

s is 0, 1, 2 or 3; and

t is 0, 1 or 2;

wherein the second monomer is one or more bi- or multifunctional compounds capable of reacting with the first monomer to give a copolymer, wherein the second monomer is one or more bi- or multifunctional compounds comprising two or more polymerizable groups, P, which are selected from groups containing a C=C double bond, groups containing two conjugated C=C double bonds, nucleophilic groups, and 1,3-dipolar groups.

2. The polymerizable mixture according to claim 1, wherein the spacer groups Sp are selected from the formula Sp'-X', so that the radical "P^1-Sp^1-" corresponds to the formula "P^1-Sp'-X'-",

wherein:

Sp' denotes

(a) straight chain alkylene having 1 to 40 C atoms or branched chain alkylene having 3 to 40 C atoms, which, in each case, is optionally mono- or polysubstituted by F, Cl, Br, I or CN and in which, in addition, one or more non-adjacent CH_2 groups may each be replaced, independently of one another, by -O-, -S-, -NH-, -NR^{01}-, -$SiR^{01}R^{02}$-, -CO-, -COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S-, -NR^{01}-CO-O-,

-O-CO-NR^{01}-, -NR^{01}-CO-NR^{01}-, -CH=CH-, or -C≡C- in such a way that O and/or S atoms are not linked directly to one another, or

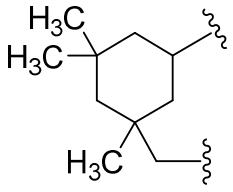
(b) -Sp^x-G-Sp^y-, wherein Sp^x and Sp^y denote independently of each other alkylene having 1 to 20 C atoms or a single bond; G denotes cycloalkylene having 3 to 20 C atoms which is optionally mono- or polysubstituted by alkyl having 1 to 20 C atoms;

X' denotes -O-, -S-, -CO-, -COO-, -OCO-, -O-COO-, -CO-NR^{01}-, -NR^{01}-CO-, -NR^{01}-CO-NR^{01}-, -OCH_2-, -CH_2O-, -SCH_2-, -CH_2S-, -CF_2O-, -OCF_2-, -CF_2S-, -SCF_2-, -CF_2CH_2-, -CH_2CF_2-, -CF_2CF_2-, -CH=N-, -N=C-, -N=N-, -CH=CR^{01}-, -CY^{01}=CY^{02}-, -C≡C-, -CH=CH-COO-, -OCO-CH=CH-, or a single bond;

R^{01} and R^{02} each, independently of one another, denote H or alkyl having 1 to 12 C atoms; and

Y^{01} and Y^{02} each, independently of one another, denote H, F, Cl or CN.

3. The polymerizable mixture according to claim 1, wherein the spacer groups Sp are selected from -$(CH_2)_{p1}$-, -$(CH_2CH_2O)_{q1}$-CH_2CH_2-, -CH_2CH_2-S-CH_2CH_2-, -CH_2CH_2-NH-CH_2CH_2-, -$(SiR^{01}R^{02}$-O$)_{p1}$-, -$(CH_2)_{p1}$-(cyclo-$C_6H_8R^{01}R^{02}$)-$(CH_2)_{p1}$-, and



, wherein:

p1 is an integer from 1 to 60;

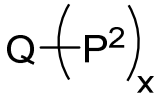
q1 is an integer from 1 to 12; and

R^{01} and R^{02} each, independently of one another, denote H or alkyl having 1 to 12 C atoms.

4. The polymerizable mixture according to claim 1, wherein the second monomer is one or more bi- or multifunctional compound selected from organic compounds, polyhedralsilsesquioxane compounds, and functionalized inorganic nanoparticles.

5. The polymerizable mixture according to claim 1, wherein the second monomer is one or more of:

(a) an organic compound represented by Formula (4):



Formula (4),

wherein:

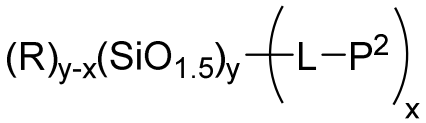
Q denotes a hydrocarbon group having 1 to 50 carbon atoms which may be optionally substituted with one or more substituents L,

wherein L is F, Cl, Br, I, -CN, $-NO_2$, -NCO, -NCS, -OCN, -SCN, $-C(=O)NR^{xx}R^{yy}$, $-C(=O)OR^{xx}$, $-C(=O)R^{xx}$, $-NR^{xx}R^{yy}$, -OH, $-SF_5$, straight chain alkyl or alkoxy having 1 to 20 C atoms, branched chain alkyl or alkoxy having 3 to 20 C atoms, straight chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy or alkoxycarbonyloxy with 2 to 20 C atoms, branched chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy or alkoxycarbonyloxy having 4 to 20 C atoms wherein in the alkyl, alkoxy, alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy or alkoxycarbonyloxy groups one or more H atoms are each optionally replaced by F, Cl, -CN, straight chain alkyl or alkoxy having 1 to 6 C atoms, branched chain alkyl or alkoxy having 3 to 6 C atoms, straight chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy or alkoxycarbonyloxy having 2 to 6 C atom, or branched chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy or alkoxycarbonyloxy having 4 to 6 C atoms, and which may optionally contain one or more hetero atom groups selected from N, O and S;

P^2 denotes a polymerizable group P as defined in claim 1; and

x is an integer from 2 to 10;

(b) a polyhedralsilsesquioxane compound represented by the following structure:



Structure (1),

wherein:

R is H, C_1-C_6-alkyl, C_2-C_6-alkenyl, C_6-C_{10}-aryl, or C_1-C_6-alkoxy;

L is C_1-C_{12}-alkylene or C_1-C_{12}-oxyalkylene, wherein one or more non-adjacent C atoms may each be replaced, independently of one another, by -$SiR^{05}R^{06}$-, wherein R^{05} and R^{06} each, independently of one another, denote H or alkyl having 1 to 6 C atoms;

P^2 denotes a polymerizable group P as defined in claim 1;

y is an integer from 6 to 12; and

x is an integer from 2 to 12,

wherein $y-x \geq 0$; or

(c) a functionalized inorganic nanoparticle which comprises polymerizable groups P^2 on its surface, wherein:

P^2 denotes a polymerizable group P as defined in claim 1.

6. A method for forming a copolymer comprising:

(i) providing a polymerizable mixture according to claim 5; and

(ii) polymerizing said polymerizable mixture to obtain a copolymer.

7. The method for forming a copolymer according to claim 6, wherein the polymerizable mixture further comprises one or more radical initiators.

8. A copolymer, obtainable by the method for forming a copolymer according to claim 6.

9. A copolymer comprising at least one repeating unit which is derived from the first monomer as defined in claim 1, and at least one repeating unit which is derived from the second monomer as defined in claim 1.

10. A copolymer according to claim 9, wherein the repeating unit derived from the first monomer comprises a structural unit represented by Formula (5):

$$[-Sp^1-(MG-Sp^1)_m-] \qquad \text{Formula (5)}$$

wherein Sp^1 and m are defined as in claim 1, and

MG is a rod shaped mesogenic group selected from Formula (2):

$$-(A^{21}-Z^{21})_k-A^{22}-(Z^{22}-A^{23})_l- \qquad \text{Formula (2)}$$

wherein:

A^{21} to A^{23} are independently and at each occurrence, independently of one another, an aryl group, heteroaryl group, heterocyclic group, alicyclic group, or cyclic imide group optionally being substituted by one or more identical or different groups L;

Z^{21} and Z^{22} are independently and at each occurrence independently from each other, -O-, -S-, -CO-, -COO-, -OCO-, -S-CO-, -CO-S-, -O-COO-, -CO-NR^{01}-, -NR^{01}-CO-, -NR^{01}-CO-NR^{02}, -NR^{01}-CO-O-, -O-CO-NR^{01}-, -OCH_2-, -CH_2O-, -SCH_2-, -CH_2S-, -CH_2CH_2-, -$(CH_2)_4$-, -CH=N-, -N=CH-, -N=N-, -CH=CR^{01}-, -CY^{01}=CY^{02}-, -C≡C-, -CH=CH-COO-, -OCO-CH=CH-, or a single bond;

R^{01} and R^{02} each, independently of one another, denote H or alkyl having 1 to 12 C atoms;

L is Cl, Br, I, -CN, -NO_2, -NCO, -NCS, -OCN, -SCN, -C(=O)$NR^{xx}R^{yy}$, -C(=O)OR^{xx}, -C(=O)R^{xx}, -$NR^{xx}R^{yy}$, -OH, -SF_5, straight chain alkyl or alkoxy having 1 to 20 C atoms, branched chain alkyl or alkoxy having 3 to 20 C atoms, straight

chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy, or alkoxycarbonyloxy with 2 to 20 C atoms, or branched chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy, or alkoxycarbonyloxy having 4 to 20 C atoms wherein, in said alkyl, alkoxy, alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy, or alkoxycarbonyloxy groups, one or more H atoms are each optionally replaced by F, Cl, -CN, straight chain alkyl or alkoxy having 1 to 6 C atoms, branched chain alkyl or alkoxy having 3 to 6 C atoms, straight chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy, or alkoxycarbonyloxy with 2 to 6 C atoms, or branched chain alkylcarbonyl, alkoxycarbonyl, alkylcarbonyloxy, or alkoxycarbonyloxy with 4 to 6 C atoms;

R^{xx} and R^{yy} independently of each other denote H or alkyl with 1 to 12 C-atoms;

Y^{01} and Y^{02} each, independently of one another, denote H, alkyl having 1 to 12 C atoms, aryl, Cl, or CN; and

k and l are each and independently 0, 1, 2, 3 or 4.

11. An electronic device comprising a copolymer according to claim 8.

12. The electronic device according to claim 11, wherein the copolymer forms a dielectric layer.

13. A manufacturing method for preparing a packaged microelectronic structure, in which a substrate is provided with a dielectric layer, wherein the method comprises:

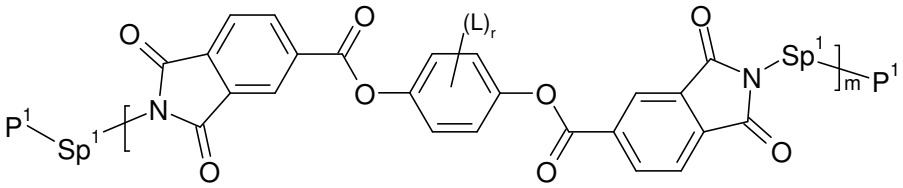
(1) applying a polymerizable mixture according to claim 1 to a surface of a substrate; and

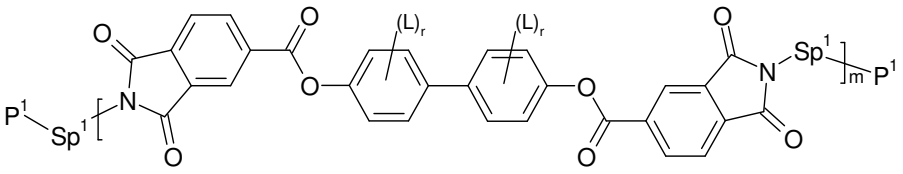
(2) curing said polymerizable mixture to form a dielectric layer.

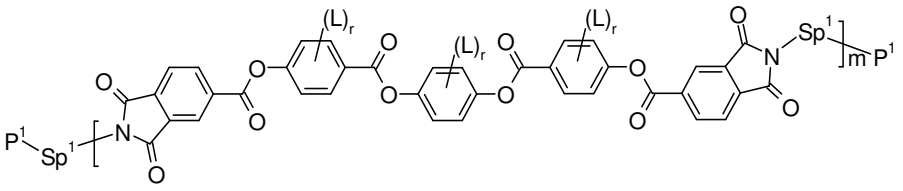
14. The manufacturing method for preparing a packaged microelectronic structure according to claim 13, wherein the polymerizable mixture further comprises one or more radical initiators.

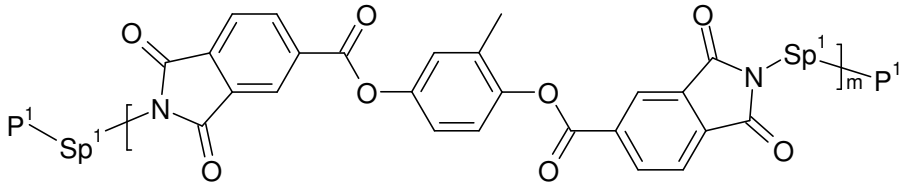
15. A microelectronic device comprising a packaged microelectronic structure obtainable by the manufacturing method according to claim 13.

16. The polymerizable mixture according to claim 1, wherein said first monomer is one or more compounds selected from the following formulae:









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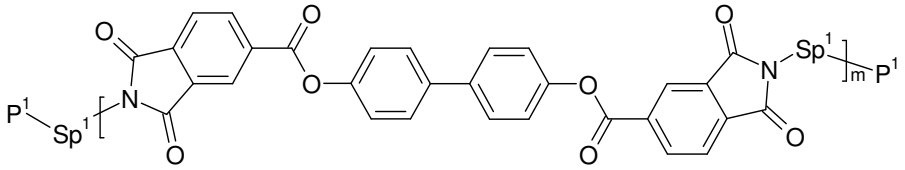

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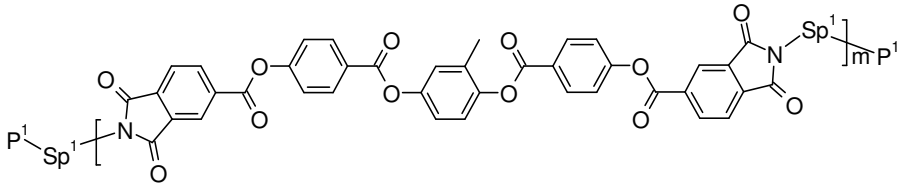

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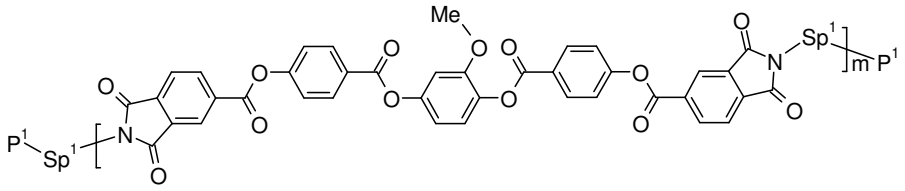

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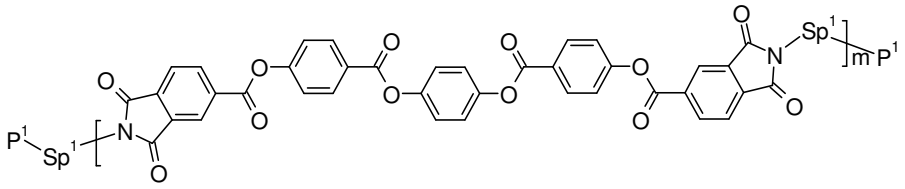

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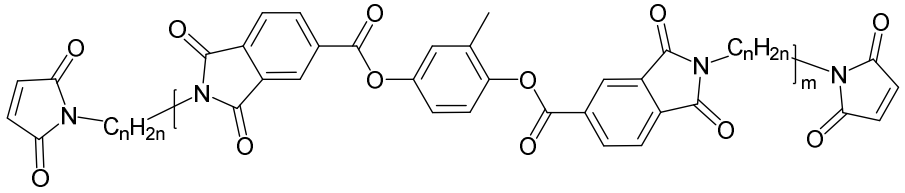

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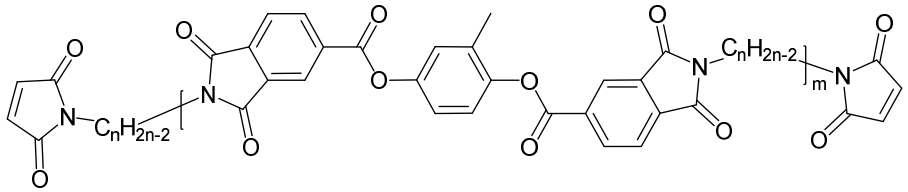

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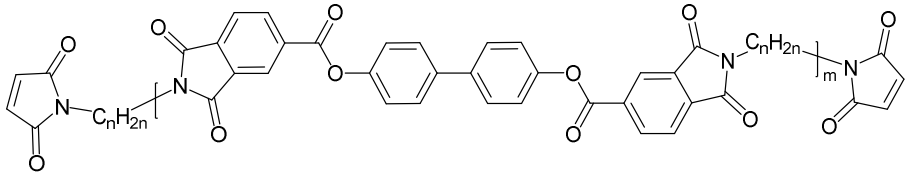

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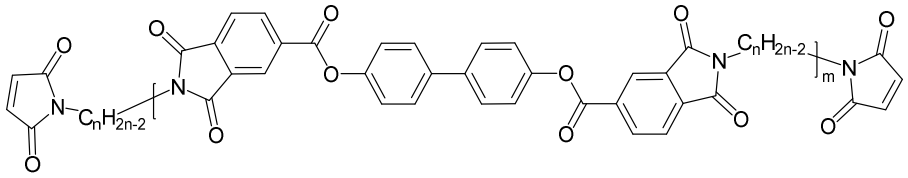

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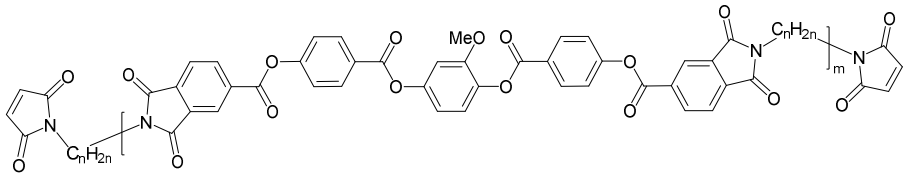

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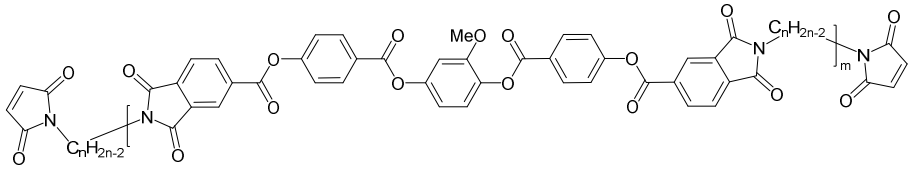

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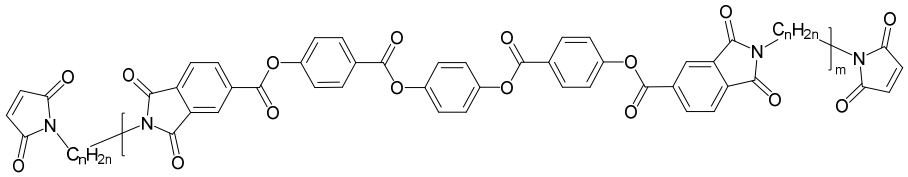

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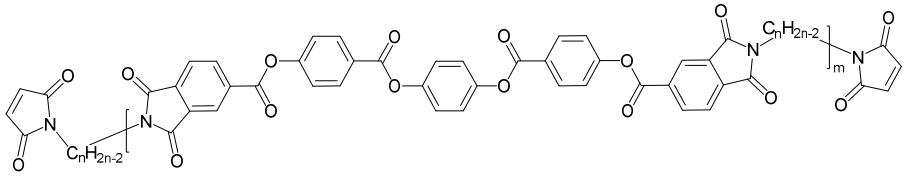

M8g

wherein

n is an integer from 1 to 60; and

m is an integer from 1 to 60.