The claimed invention is:

1. A composition, comprising:

at least one cyclic olefin;

at least one cyclic olefin metathesis catalyst;

at least one adhesion promoter comprising at least one compound containing at least two isocyanate groups; and

and at least one hydroperoxide gel modifier, in an amount effective to increase the gel time of a cyclic olefin metathesis reaction of the cyclic olefin catalyzed by the cyclic olefin metathesis catalyst in the absence of the hydroperoxide gel modifier.

2. A composition, comprising:

at least one cyclic olefin;

at least one cyclic olefin metathesis catalyst; and

at least one hydroperoxide gel modifier, in an amount effective to increase the gel time of a cyclic olefin metathesis reaction of the cyclic olefin catalyzed by the cyclic olefin metathesis catalyst in the absence of the hydroperoxide gel modifier.

3. A composition, comprising:

at least one cyclic olefin;

at least one cyclic olefin metathesis catalyst;

at least one adhesion promoter comprising at least one compound containing at least two isocyanate groups; and

at least one glass substrate.

4. A method for improving the adhesion of a resin composition to a substrate material, comprising:

combining at least one adhesion promoter, at least one cyclic olefin, at least one hydroperoxide gel modifier, and at least one olefin metathesis catalyst to form the resin composition,

contacting the resin composition with the substrate material, and

subjecting the resin composition to conditions effective to promote an olefin metathesis reaction of the cyclic olefin,

wherein the at least one adhesion promoter comprises at least one compound containing at least two isocyanate groups,

wherein the at least one hydroperoxide gel modifier in present in an amount effective to increase the gel time of a cyclic olefin metathesis reaction of the cyclic olefin catalyzed by the cyclic olefin metathesis catalyst in the absence of the hydroperoxide gel modifier.

5. A method for improving the adhesion of a resin composition to a glass substrate material, comprising:

combining at least one adhesion promoter, at least one cyclic olefin, and at least one olefin metathesis catalyst to form the resin composition,

contacting the resin composition with the glass substrate material, and

subjecting the resin composition to conditions effective to promote an olefin metathesis reaction of the cyclic olefin,

wherein the at least one adhesion promoter comprises at least one compound containing at least two isocyanate groups.

6. A method for improving the adhesion of a resin composition to a glass substrate material, comprising:

combining at least one cyclic olefin, at least one olefin metathesis catalyst, at least one adhesion promoter, and at least one glass substrate material to form the resin composition, and

subjecting the resin composition to conditions effective to promote an olefin metathesis reaction of the cyclic olefin,

wherein the at least one adhesion promoter comprises at least one compound containing at least two isocyanate groups.

7. A method for improving the adhesion of a resin composition to a substrate material, comprising:

combining at least one cyclic olefin, at least one olefin metathesis catalyst, at least one adhesion promoter, at least one hydroperoxide gel modifier, and at least one substrate material to form the resin composition, and

subjecting the resin composition to conditions effective to promote an olefin metathesis reaction of the cyclic olefin,

wherein the at least one adhesion promoter comprises at least one compound containing at least two isocyanate groups,

wherein the at least one hydroperoxide gel modifier in present in an amount effective to increase the gel time of a cyclic olefin metathesis reaction of the cyclic olefin catalyzed by the cyclic olefin metathesis catalyst in the absence of the hydroperoxide gel modifier.

8. A method for improving the adhesion of a resin composition to a glass substrate material, comprising:

combining at least one cyclic olefin and at least one olefin metathesis catalyst to form the resin composition,

contacting at least one adhesion promoter with at least one surface of the glass substrate material,

applying the resin composition to the at least one surface of the glass substrate material, and

subjecting the resin composition to conditions effective to promote an olefin metathesis reaction of the cyclic olefin,

wherein the at least one adhesion promoter comprises at least one compound containing at least two isocyanate groups.

9. A method for improving the adhesion of a resin composition to a substrate material, comprising:

combining at least one cyclic olefin, at least one hydroperoxide gel modifier, and at least one olefin metathesis catalyst to form the resin composition,

contacting at least one adhesion promoter with at least one surface of the substrate material,

applying the resin composition to the at least one surface of the substrate material, and

subjecting the resin composition to conditions effective to promote an olefin metathesis reaction of the cyclic olefin,

wherein the at least one adhesion promoter comprises at least one compound containing at least two isocyanate groups,

wherein the at least one hydroperoxide gel modifier in present in an amount effective to increase the gel time of a cyclic olefin metathesis reaction of the cyclic olefin catalyzed by the cyclic olefin metathesis catalyst in the absence of the hydroperoxide gel modifier.

10. A method for modifying the onset of a ROMP reaction of a cyclic olefin catalyzed by a cyclic olefin metathesis catalyst, comprising:

combining a hydroperoxide gel modifier with a cyclic olefin and a cyclic olefin metathesis catalyst, thereby forming a ROMP composition, and

subjecting the ROMP composition to conditions effective to promote a ROMP reaction of the cyclic olefin in the presence of the cyclic olefin metathesis catalyst and the added hydroperoxide gel modifier,

wherein the hydroperoxide is added in an amount effective to increase the gel time of the ROMP reaction of the cyclic olefin catalyzed by the cyclic olefin metathesis catalyst in the absence of the added hydroperoxide.

11. In a ROMP reaction of an olefin composition comprising a cyclic olefin and an olefin metathesis catalyst, wherein the ROMP reaction of the cyclic olefin is catalyzed by the olefin metathesis catalyst, the improvement comprising adding a hydroperoxide gel modifier to the olefin composition, in an amount effective to increase the gel time of the ROMP reaction of the cyclic olefin catalyzed by the olefin metathesis catalyst in the absence of the added hydroperoxide.

12. An article of manufacture comprising at least one resin composition containing at least one cyclic olefin, at least one olefin metathesis catalyst, and at least one adhesion promoter comprising at least one compound containing at least two isocyanate groups.

13. An article of manufacture comprising at least one resin composition containing at least one cyclic olefin, at least one olefin metathesis catalyst, at least one adhesion promoter comprising at least one compound containing at least two isocyanate groups, and at least one hydroperoxide gel modifier.

14. An article of manufacture comprising at least one resin composition containing at least one cyclic olefin, at least one olefin metathesis catalyst, and at least one hydroperoxide gel modifier.

15. Use of at least one compound containing at least two isocyanate groups as an adhesion promoter for adhering a metathesis-polymerized resin composition to a glass substrate material.

16. Use of at least one compound containing at least two isocyanate groups as an adhesion promoter and at least one hydroperoxide gel modifier for adhering a metathesis-polymerized resin composition to a substrate material

17. Use of at least one hydroperoxide gel modifier for modifying the onset of a ROMP reaction of a cyclic olefin catalyzed by a cyclic olefin metathesis catalyst.

18. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claim 17, wherein the at least one cyclic olefin is functionalized.

19. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claim 17, wherein the at least one cyclic olefin is substituted.

20. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claim 17, wherein the at least one cyclic olefin contains at least one heteroatom.

21. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claim 17, wherein the at least one cyclic olefin is mono-unsaturated, di-unsaturated, or poly-unsaturated.

22. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claim 17, wherein the at least one cyclic olefin is selected from strained cyclic olefins, unstrained cyclic olefins, acyclic olefins, dienes, and unsaturated polymers, or combinations thereof, wherein the cyclic olefin may contain a functional group, or be substituted with a group, selected from

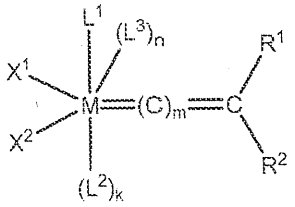
halogen, hydroxyl, hydrocarbyl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, aralkyloxy, alkaryloxy, acyl, acyloxy, alkoxycarbonyl, alkylcarbonato, arylcarbonato, carboxy, carboxylato, carbamoyl, alkyl-substituted carbamoyl, haloalkyl-substituted carbamoyl, aryl-substituted carbamoyl, thiocarbamoyl alkyl-substituted thiocarbamoyl, aryl-substituted thiocarbamoyl, carbamido, cyano, cyanato, thiocyanato, formyl, thioformyl, amino, alkyl-substituted amino, aryl-substituted amino, alkylamido, arylamido, imino, alkylimino, arylimino, nitro, nitroso, sulfo, sulfonato, alkylsulfanyl, arylsulfanyl, alkylsulfinyl, arylsulfinyl, alkylsulfonyl, alkylaminosulfonyl, arylsulfonyl, boryl, borono, boronato, phosphono, phosphonato, phosphinato, phospho, phosphino, or a combination thereof.

23. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claim 17, wherein the at least one cyclic olefin is selected from cyclobutene, cycloheptene, cyclooctene, cyclononene, cyclodecene, cyclooctadiene, cyclononadiene, cyclododecatriene, tetracyclododecadiene, substituted norbornenes, substituted dicyclopentadienes, dicyclopentadiene, tricyclopentadiene, dicyclohexadiene, norbornene, 5-methyl-2-norbornene, 5-ethyl-2-norbornene, 5-isobutyl-2-norbornene, 5,6-dimethyl-2-norbornene, 5-phenylnorbornene, 5-benzylnorbornene, 5-acetylnorbornene, 5-methoxycarbonylnorbornene, 5–ethoxycarbony-1-norbornene, 5-methyl-5-methoxy-carbonylnorbornene, 5-cyanonorbornene, 5,5,6-trimethyl-2-norbornene, cyclo-hexenylnorbornene, endo, exo-5,6-dimethoxynorbornene, endo, endo-5,6-dimethoxynorbornene, endo,exo-5,6-dimethoxycarbonylnorbornene, endo, endo-5,6-dimethoxycarbonylnorbornene, 2,3-dimethoxynorbornene, norbornadiene, tricycloundecene, tetracyclododecene, 8-methyltetracyclododecene, 8-ethyl-tetracyclododecene, 8-methoxycarbonyltetracyclododecene, 8-methyl-8-tetracyclo-dodecene, 8-cyanotetracyclododecene, pentacyclopentadecene, or pentacyclohexadecene, or a combination thereof.

24. The composition, method, reaction, article of manufacture, and use of claim 23, wherein the at least one cyclic olefin is selected from cyclobutene, cycloheptene, cyclooctene, cyclononene, cyclodecene, cyclooctadiene, cyclononadiene, norbornene, dicyclopentadiene, or a combination thereof.

25. The composition, method, reaction, article of manufacture, and use of claim 24, wherein the at least one cyclic olefin is dicyclopentadiene.

26. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claim 17, wherein the at least one cyclic olefin metathesis catalyst is a Group 8 transition metal complex having the structure of formula (I)

(I) 

in which:

M is a Group 8 transition metal;

L^1, L^2, and L^3 are independently selected from neutral electron donor ligands;

n is 0 or 1, such that L^3 may or may not be present;

m is 0, 1, or 2;

k is 0 or 1;

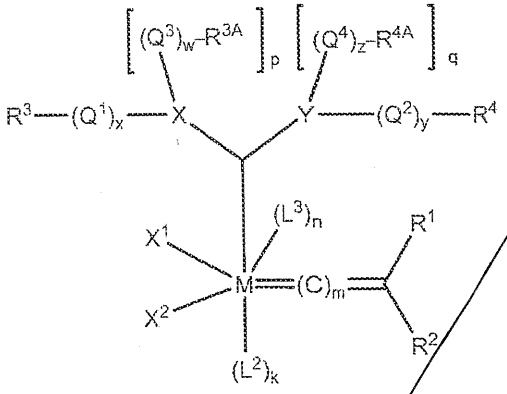
X^1 and X^2 are independently anionic ligands; and

R^1 and R^2 are independently selected from hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, substituted heteroatom-containing hydrocarbyl, and functional groups; wherein one or both of R^1 and R^2 may have the structure $-(W)_n-U^+V^-$, in which W is selected from hydrocarbylene, substituted hydrocarbylene, heteroatom-containing hydrocarbylene, or substituted heteroatom-containing hydrocarbylene; U is a positively charged Group 15 or Group 16 element substituted with hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, or substituted heteroatom-containing hydrocarbyl; V is a negatively charged counterion; and n is zero or 1,

wherein any two or more of X^1, X^2, L^1, L^2, L^3, R^1, and R^2 can be taken together to form one or more cyclic groups, and further wherein any one or more of X^1, X^2, L^1, L^2, L^3, R^1, and R^2 may be attached to a support.

27. The composition, method, reaction, article of manufacture, and use of claim 26, wherein at least one of L^1, L^2, and L^3 is an N-heterocyclic carbene ligand.

28. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claim 17, wherein the at least one cyclic olefin metathesis catalyst has the structure



wherein,

M is a Group 8 transition metal;

n is 0 or 1;

m is 0, 1, or 2;

k is 0 or 1;

X^1 and X^2 are independently selected from anionic ligands;

L^2 and L^3 are independently selected from neutral electron donor ligands, or may be taken together to form a single bidentate electron-donating heterocyclic ligand;

R^1 and R^2 are independently selected from hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, substituted heteroatom-containing hydrocarbyl, and functional groups;

X and Y are independently selected from C, N, O, S, and P;

p is zero when X is O or S, and p is 1 when X is N or P;

q is zero when Y is O or S, and q is 1 when Y is N or P;

Q^1, Q^2, Q^3, and Q^4 are independently selected from hydrocarbylene, substituted hydrocarbylene, heteroatom-containing hydrocarbylene, substituted heteroatom-containing hydrocarbylene, and -(CO)- , and further wherein two or more substituents on adjacent atoms within Q may be linked to form an additional cyclic group;

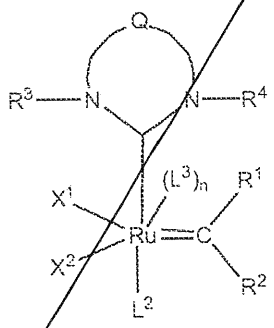
w, x, y, and z are independently zero or 1; and

R^3, R^{3A}, R^4, and R^{4A} are independently selected from hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, and substituted heteroatom-containing hydrocarbyl,

wherein any two or more of X^1, X^2, L^2, L^3, R^1, R^2, Q^1, Q^2, Q^3, Q^4, R^3, R^{3A}, R^4, and R^{4A} can be taken together to form a cyclic group, and further wherein any one or more of X^1, X^2, L^2, L^3, Q^1, Q^2, Q^3, Q^4, R^1, R^2, R^3, R^{3A}, R^4, and R^{4A} may be attached to a support.

29. The composition, method, reaction, article of manufacture, and use of claim 28, wherein R^1 and R^2 are taken together to form an indenylidene moiety

30. The composition, method, reaction, article of manufacture, and use of claim 28, wherein M is ruthenium, w, x, y, and z are zero, X and Y are N, and R^{3A} and R^{4A} are linked to form -Q-, such that the complex has the structure



wherein Q is a hydrocarbylene, substituted hydrocarbylene, heteroatom-containing hydrocarbylene, or substituted heteroatom-containing hydrocarbylene linker, and further wherein two or more substituents on adjacent atoms within Q may be linked to form an additional cyclic group.

31. The composition, method, reaction, article of manufacture, and use of claim 30, wherein:

X^1 and X^2 are halo;

Q is $-CR^{11}R^{12}-CR^{13}R^{14}-$ or $-CR^{11}=CR^{13}-$, wherein R^{11}, R^{12}, R^{13}, and R^{14} are independently selected from hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, substituted heteroatom-containing hydrocarbyl, and functional groups,

or wherein any two of R^{11}, R^{12}, R^{13}, and R^{14} may be linked together to form a substituted or unsubstituted, saturated or unsaturated ring; and

R^3 and R^4 are aromatic.

32. The composition, method, reaction, article of manufacture, and use of claims 30 or 31, wherein:

Q is $-CR^{11}R^{12}-CR^{13}R^{14}-$ wherein R^{11}, R^{12}, R^{13}, and R^{14} are independently selected from hydrogen, C_1-C_{12} alkyl, substituted C_1-C_{12} alkyl, C_1-C_{12} heteroalkyl, substituted C_1-C_{12} heteroalkyl, phenyl, and substituted phenyl; and

R^3 and R^4 are unsubstituted phenyl or phenyl substituted with one or more substituents selected from C_1-C_{20} alkyl, substituted C_1-C_{20} alkyl, C_1-C_{20} heteroalkyl, substituted C_1-C_{20} heteroalkyl, C_5-C_{24} aryl, substituted C_5-C_{24} aryl, C_5-C_{24} heteroaryl, C_6-C_{24} aralkyl, C_6-C_{24} alkaryl, or halide.

33. The composition, method, reaction, article of manufacture, and use of claim 28, wherein two or more of X^1, X^2, L^2, L^3, R^1, R^2, Q^1, Q^2, Q^3, Q^4, R^3, R^{3A}, R^4, and R^{4A} together form a cyclic group.

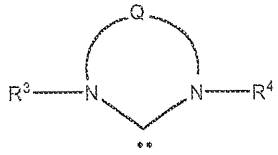
34. The composition, method, reaction, article of manufacture, and use of claim 33, wherein the cyclic group is formed from R^1 and/or R^2 taken together with one or more of X^1, X^2, L^2, L^3, Q^1, Q^2, Q^3, Q^4, R^3, R^{3A}, R^4, and R^{4A}.

35. The composition, method, reaction, article of manufacture, and use of claim 33, wherein the cyclic group is formed from R^1 and/or R^2 taken together with one or more of L^2, L^3, R^3, R^{3A}, R^4, and R^{4A}.

36. The composition, method, reaction, article of manufacture, and use of claim 28, wherein one or more of X^1, X^2, L^2, L^3, X, and Y is further coordinated to boron or to a carboxylate.

37. The composition, method, reaction, article of manufacture, and use of claim 28, wherein R^3 and R^4 are mesityl.

38. The composition, method, reaction, article of manufacture, and use of claim 27, wherein the N-heterocyclic carbene ligand has the structure



wherein,

Q is $-CR^{11}R^{12}-CR^{13}R^{14}-$ or $-CR^{11}=CR^{13}-$, wherein R^{11}, R^{12}, R^{13}, and R^{14} are independently selected from hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, substituted heteroatom-containing hydrocarbyl, and functional groups, or wherein any two of R^{11}, R^{12}, R^{13}, and R^{14} may be linked together to form a substituted or unsubstituted, saturated or unsaturated ring; and

R^3 and R^4 are unsubstituted phenyl or phenyl substituted with one or more substituents selected from C_1-C_{20} alkyl, substituted C_1-C_{20} alkyl, C_1-C_{20} heteroalkyl, substituted C_1-C_{20} heteroalkyl, C_5-C_{24} aryl, substituted C_5-C_{24} aryl, C_5-C_{24} heteroaryl, C_6-C_{24} aralkyl, C_6-C_{24} alkaryl, or halide.

39. The composition, method, reaction, article of manufacture, and use of claim 26, wherein one or more of L^1, L^2, and L^3 is selected from nitrogen-containing heterocycles, sulfur-containing heterocycles, and oxygen-containing heterocycles.

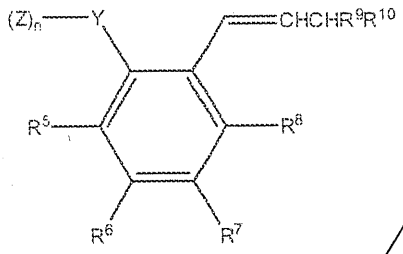
40. The composition, method, reaction, article of manufacture, and use of claim 26, wherein L^2 and L^3 are selected from nitrogen-containing heterocycles.

41. The composition, method, reaction, article of manufacture, and use of claim 40, wherein L^2 and L^3 are selected from pyridine, bipyridine, pyridazine, pyrimidine, bipyridamine, pyrazine, 1,3,5-triazine, 1,2,4-triazine, 1,2,3-triazine, pyrrole, 2H-pyrrole, 3H-pyrrole, pyrazole, 2H-imidazole, 1,2,3-triazole, 1,2,4-triazole, indole, 3H-indole, 1H-isoindole, cyclopenta(b)pyridine, indazole, quinoline, bisquinoline, isoquinoline, bisisoquinoline, cinnoline, quinazoline, naphthyridine, piperidine, piperazine, pyrrolidine, pyrazolidine, quinuclidine, imidazolidine, picolylimine, purine, benzimidazole, bisimidazole, phenazine, acridine, carbazole, any of which is optionally substituted on a non-coordinating heteroatom with a non-hydrogen substituent.

42. The composition, method, reaction, article of manufacture, and use of claim 41, wherein L^2 and L^3 are selected from pyridine and substituted pyridines.

43. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claim 17, wherein the at least one cyclic olefin metathesis catalyst comprises a chelating alkylidene ligand.

44. The composition, method, reaction, article of manufacture, and use of claim 43, wherein the chelating ligand is derived from a ligand precursor having the formula



wherein,

Y is a heteroatom selected from N, O, S, and P;

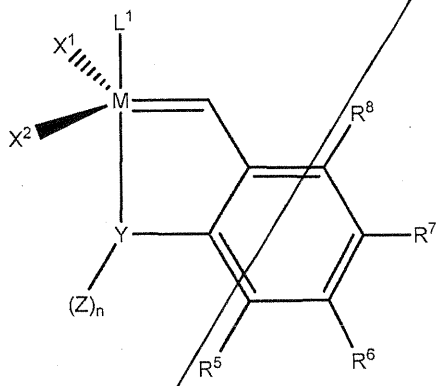
n is 1 or 2, such that n is 1 for the divalent heteroatoms O or S, and n is 2 for the trivalent heteroatoms N or P;

Z is a group selected from hydrogen, alkyl, aryl, functionalized alkyl, functionalized aryl where the functional group(s) may independently be one or more or the following: alkoxy, aryloxy, halogen, carboxylic acid, ketone, aldehyde, nitrate, cyano, isocyanate, hydroxyl, ester, ether, amine, imine, amide, trifluoroamide, sulfide, disulfide, carbamate, silane, siloxane, phosphine, phosphate, or borate; methyl, isopropyl, sec-butyl, t-butyl, neopentyl, benzyl, phenyl and trimethylsilyl; and

R^5, R^6, R^7, and R^8 are each, independently, selected from the group consisting of hydrogen, halogen, alkyl, alkenyl, alkynyl, aryl, heteroalkyl, heteroatom containing alkenyl, heteroalkenyl, heteroaryl, alkoxy, alkenyloxy, aryloxy, alkoxycarbonyl, carbonyl, alkylamino, alkylthio, aminosulfonyl, monoalkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, nitrile, nitro, alkylsulfinyl, trihaloalkyl, perfluoroalkyl, carboxylic acid, ketone, aldehyde, nitrate, cyano, isocyanate, hydroxyl, ester, ether, amine, imine, amide, halogen-substituted amide, trifluoroamide, sulfide, disulfide, sulfonate, carbamate, silane, siloxane, phosphine, phosphate, borate, or --A-Fn, wherein A is a divalent hydrocarbon moiety selected from alkylene and arylalkylene, wherein the alkyl portion of the alkylene and arylalkylene groups can be linear or branched, saturated or unsaturated, cyclic or acyclic, and substituted or unsubstituted, wherein

the aryl portion of the of arylalkylene can be substituted or unsubstituted, and wherein hetero atoms and/or functional groups may be present in either the aryl or the alkyl portions of the alkylene and arylalkylene groups, and Fn is a functional group; and any combination of R^5, R^6, R^7, and R^8 can be linked to form one or more cyclic groups;R^9 and R^{10} are each, independently, selected from hydrogen or a substituent group selected from alkyl, aryl, alkoxy, aryloxy, C_2-C_{20} alkoxycarbonyl, or C_1-C_{20} trialkylsilyl, wherein each of the substituent groups is substituted or unsubstituted; and wherein any combination or combinations of Z, Y, R^5, R^6, R^7, R^8, R^9, and R^{10} may be linked to a support.

45. The composition, method, reaction, article of manufacture, and use of claim 44, wherein the at least one cyclic olefin metathesis catalyst has the structure



wherein,

M is a Group 8 transition metal;

X^1 and X^2 are independently anionic ligands;

L^1 is selected from neutral electron donor ligands;

Y is a heteroatom selected from N, O, S, and P;

R^5, R^6, R^7, and R^8 are each, independently, selected from the group consisting of hydrogen, halogen, alkyl, alkenyl, alkynyl, aryl, heteroalkyl, heteroatom containing alkenyl, heteroalkenyl, heteroaryl, alkoxy, alkenyloxy, aryloxy, alkoxycarbonyl, carbonyl, alkylamino, alkylthio, aminosulfonyl, monoalkylaminosulfonyl, dialkylaminosulfonyl, alkylsulfonyl, nitrile, nitro, alkylsulfinyl, trihaloalkyl, perfluoroalkyl, carboxylic acid, ketone, aldehyde, nitrate, cyano, isocyanate, hydroxyl, ester, ether, amine, imine, amide, halogen-substituted amide, trifluoroamide, sulfide, disulfide, sulfonate, carbamate, silane, siloxane, phosphine, phosphate, borate, or –A-Fn, wherein A is a divalent hydrocarbon moiety selected from alkylene and

arylalkylene, wherein the alkyl portion of the alkylene and arylalkylene groups can be linear or branched, saturated or unsaturated, cyclic or acyclic, and substituted or unsubstituted, wherein the aryl portion of the of arylalkylene can be substituted or unsubstituted, and wherein hetero atoms and/or functional groups may be present in either the aryl or the alkyl portions of the alkylene and arylalkylene groups, and Fn is a functional group; and any combination of R^5, R^6, R^7, and R^8 can be linked to form one or more cyclic groups;

n is 1 or 2, such that n is 1 for the divalent heteroatoms O or S, and n is 2 for the trivalent heteroatoms N or P; and

Z is a group selected from hydrogen, alkyl, aryl, functionalized alkyl, functionalized aryl where the functional group may independently be one or more or the following: alkoxy, aryloxy, halogen, carboxylic acid, ketone, aldehyde, nitrate, cyano, isocyanate, hydroxyl, ester, ether, amine, imine, amide, trifluoroamide, sulfide, disulfide, carbamate, silane, siloxane, phosphine, phosphate, or borate; methyl, isopropyl, sec-butyl, t-butyl, neopentyl, benzyl, phenyl and trimethylsilyl; and wherein any combination or combinations of X^1, X^2, L^1, Y, Z, R^5, R^6, R^7, and R^8 may be linked to a support.

46. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claim 17, wherein the at least one cyclic olefin metathesis catalyst is selected from the group consisting of [1,3-bis-(2,4,6-trimethylphenyl)-2-imidazolid-inylidene]dichloro(3-methyl-2-butenylidene)(tricyclohexylphosphine) ruthenium (II), ruthenium (II) dichloro (tricyclohexylphosphine) (o-isopropoxyphenylmethylene), [1,3-bis-(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro(benzylidene)(tri(*n*-butyl)phosphine) ruthenium (II), and [1,3-bis-(2,4,6-trimethylphenyl)-2-imidazolidinylidene]dichloro(phenylindenylidene)(tri(*n*-butyl)-phosphine) ruthenium (II).

47. The composition of claims 1 or 3, the methods of claims 4, 5, 6, 7, 8, or 9, the articles of manufacture of claims 12 or 13, or the use of claims 15 or 16, wherein the at least one compound containing at least two isocyanate groups is a compound selected from hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, substituted heteroatom-containing hydrocarbyl, functionalized hydrocarbyl compounds, or mixtures thereof.

48. The composition of claims 1 or 3, the methods of claims 4, 5, 6, 7, 8, or 9, the articles of manufacture of claims 12 or 13, or the use of claims 15 or 16, wherein the at least one compound containing at least two isocyanate groups is selected from at least one diisocyanate, triisocyanate, polyisocyanate compound, or mixtures thereof.

49. The composition, method, article of manufacture, or use of claim 48, wherein the at least one compound containing at least two isocyanate groups is a diisocyanate compound or mixtures thereof.

50. The composition, method, article of manufacture, or use of claim 49, wherein the diisocyanate compound does not contain an olefin metathesis active group.

51. The composition, method, article of manufacture, or use of claim 50, wherein the diisocyanate compound is selected from methylene diphenyl diisocyanate, hexamethylene diisocyanate, or mixtures thereof.

52. The composition, method, article of manufacture, or use of claim 50, wherein the at least one diisocyanate compound is selected from at least one alkyl diisocyanate, at least one cycloalkyl diisocyanate, at least one aryl diisocyanate, at least one polymer-containing diisocyanate, or mixtures thereof.

53. The composition, method, article of manufacture, or use of claim 52, wherein the at least one alkyl diisocyanate is selected from hexamethylene diisocyanate, octamethylene diisocyanate, decamethylene diisocyanate, or mixtures thereof.

54. The composition, method, article of manufacture, or use of claim 52, wherein the at least one cycloalkyl diisocyanate is selected from at least one cyclohexyl diisocyanate, cycloctyl diisocyanate, cyclodecyl diisocyanate, or mixtures thereof.

55. The composition, method, article of manufacture, or use of claim 54, wherein the at least one cycloalkyl diisocyanate is selected from 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethyl-cyclohexane, isocyanato-[(isocyanatocyclohexyl)methyl] cyclohexane, or mixtures thereof.

56. The composition, method, article of manufacture, or use of claim 52, wherein the at least one aryl diisocyanate is selected from tetramethylxylene diisocyanate, methylene diphenyl diisocyanate, or mixtures thereof.

57. The composition, method, article of manufacture, or use of claim 52, wherein the at least one polymer-containing diisocyanate is selected from at least one poly-methylene diphenyl diisocyanate (poly MDI) or isocyanate terminated polybutadiene prepolymers.

58. The composition, method, article of manufacture, or use of claim 52, wherein the at least one alkyl diisocyanate, at least one aryl diisocyanate, or mixtures thereof are reacted to form a trimer.

59. The composition, method, article of manufacture, or use of claim 58, wherein the trimer is selected from hexamethylene diisocyanate trimer, isophorone diisocyanate trimer, toluene diisocyanate trimer, tetramethylxylene diisocyanate trimer, or methylene diphenyl diisocyanate trimer.

60. The composition of claims 1 or 3, the methods of claims 4, 5, 6, 7, 8, or 9, the articles of manufacture of claims 12 or 13, or the use of claims 15 or 16, wherein the at least one adhesion promoter is present in an amount effective to increase the adhesion of the composition to the at least one substrate material, when the composition has been contacted with, and polymerized in the presence of, the at least one substrate material.

61. The composition of claims 1 or 3, the methods of claims 4, 5, 6, 7, 8, or 9, the articles of manufacture of claims 12 or 13, or the use of claims 15 or 16, wherein the at least one adhesion promoter is present in an amount ranging from 0.001 to 50 phr.

62. The composition of claims 1 or 3, the methods of claims 4, 5, 6, 7, 8, or 9, the articles of manufacture of claims 12 or 13, or the use of claims 15 or 16, wherein the at least one adhesion promoter further comprises at least one compound containing at least one heteroatom-containing functional group and at least one metathesis-active olefin.

63. The composition, method, article of manufacture, or use of claim 62, wherein the at least one heteroatom-containing functional group is a hydroxyl, amine, thiol, phosphorus-containing functional group, or silane functional group.

64. The composition, method, article of manufacture, or use of claim 62, wherein the at least one compound containing at least one heteroatom-containing functional group and at least one metathesis-active olefin is selected from 5-norbornene-2-methanol or 2-hydroxyethyl bicyclo[2.2.1]hept-2-ene-5-carboxylate.

65. The composition of claims 1 or 2, the methods of claims 4, 7, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 13 or 14, or the use of claims 16 or 17, wherein the hydroperoxide gel modifier content ranges from 0.01 to 1000 ppm.

66. The composition of claims 1 or 2, the methods of claims 4, 7, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 13 or 14, or the use of claims 16 or 17, wherein the hydroperoxide gel modifier content ranges from 0.05 to 100 ppm.

67. The composition of claims 1 or 2, the methods of claims 4, 7, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 13 or 14, or the use of claims 16 or 17, wherein the hydroperoxide gel modifier content ranges from 0.1 to 20 ppm.

68. The composition of claims 1 or 2, the methods of claims 4, 7, 9, or 10, the recation of claim 11, the articles of manufacture of claims 13 or 14, or the use of claims 16 or 17, wherein the gel time is increased by from about 2 minutes to about 12 hours.

69. The composition of claims 1 or 2, the methods of claims 4, 7, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 13 or 14, or the use of claims 16 or 17, wherein the gel time is increased by from about 10 minutes to about 6 hours.

70. The composition of claims 1 or 2, the methods of claims 4, 7, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 13 or 14, or the use of claims 16 or 17, wherein the gel time is increased by from about 20 minutes to about 2 hours.

71. The composition of claims 1 or 2, the methods of claims 4, 7, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 13 or 14, or the use of claims 16 or 17, wherein

the hydroperoxide gel modifier is selected from alkyl hydroperoxides, aryl hydroperoxides, alkaryl hydroperoxides, or combinations thereof.

72. The composition of claims 1 or 2, the methods of claims 4, 7, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 13 or 14, or the use of claims 16 or 17, wherein the hydroperoxide gel modifier is selected from C_2-C_{24} alkyl hydroperoxides, C_6-C_{24} aryl hydroperoxides, C_6-C_{24} alkaryl hydroperoxides, or combinations thereof.

73. The composition of claims 1 or 2, the methods of claims 4, 7, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 13 or 14, or the use of claims 16 or 17, wherein the hydroperoxide gel modifier is selected from *tert*-butyl hydroperoxide, *tert*-amyl hydroperoxide, cumene hydroperoxide, diisopropyl benzene hydroperoxide, (2,5-dihydroperoxy)-2,5-dimethylhexane, paramenthane hydroperoxide, triphenylmethyl hydroperoxide, pinane hydroperoxide, or combinations thereof.

74. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, or 9, the articles of manufacture of claims 12, 13, or 14, or the use of claims 16 or 17, wherein the composition is selected from a ring-opening metathesis polymerization composition, a ring-opening cross metathesis composition, a cross metathesis composition, a self-metathesis reaction, an ethenolysis reaction, an alkenolysis reaction, an acyclic diene metathesis polymerization composition, or combinations thereof.

75. The composition of claims 1 or 2, the methods of claims 10 or 11, the reaction of claim 11, the articles of manufacture of claims 13 or 14, or the use of claim 17, further comprising at least one substrate material.

76. The composition, method, reaction, article of manufacture, or use of claim 75, wherein the at least one substrate material comprises a functionalized substrate material.

77. The composition, method, reaction, article of manufacture, or use of claim 76, wherein the functionalized substrate material comprises a heteroatom-functionalized substrate material.

78. The composition, method, reaction, article of manufacture, or use of claim 77, wherein the heteroatom-functionalized substrate material comprises an amino functionalized substrate material.

79. The composition, method, reaction, article of manufacture, or use of claim 75, wherein the at least one substrate material is selected from reinforcing materials, glass fibers, glass fabrics, carbon fibers, carbon fabrics, aramid fibers, aramid fabrics, polyolefin fibers, polyolefin fabrics, polymer fibers, or polymer fabrics.

80. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, or 10, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claims or 15, 16, or 17, further comprising at least one additive.

81. A substrate having at least one surface coated with the composition of claims 1, 2, or 3.

82. The composition of claims 1, 2, or 3, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claims 16 or 17, wherein the composition has been subjected to conditions effective to promote an olefin metathesis reaction of the cyclic olefin.

83. The composition of claims 1, 2, or 3, the methods of claims 4, 5, 6, 7, 8, 9, 10, or 11, the reaction of claim 11, the articles of manufacture of claims 12, 13, or 14, or the use of claims 15, 16, or 17, wherein a crosslinker selected from dialkyl peroxides, diacyl peroxides, and peroxyacids is excluded.

The claimed invention is:

1. A composition, comprising:

at least one cyclic olefin;

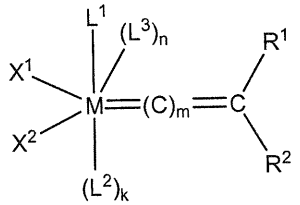
at least one olefin metathesis catalyst; and

at least one adhesion promoter comprising at least two isocyanate groups.

2. The composition of claim 1, wherein the at least one cyclic olefin is selected from strained cyclic olefins, unstrained cyclic olefins, acyclic olefins, dienes, and unsaturated polymers, or combinations thereof, wherein the cyclic olefin may contain a functional group, or be substituted with a group, selected from halogen, hydroxyl, hydrocarbyl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, aralkyloxy, alkaryloxy, acyl, acyloxy, alkoxycarbonyl, alkylcarbonato, arylcarbonato, carboxy, carboxylato, carbamoyl, alkyl-substituted carbamoyl, haloalkyl-substituted carbamoyl, aryl-substituted carbamoyl, thiocarbamoyl alkyl-substituted thiocarbamoyl, aryl-substituted thiocarbamoyl, carbamido, cyano, cyanato, thiocyanato, formyl, thioformyl, amino, alkyl-substituted amino, aryl-substituted amino, alkylamido, arylamido, imino, alkylimino, arylimino, nitro, nitroso, sulfo, sulfonato, alkylsulfanyl, arylsulfanyl, alkylsulfinyl, arylsulfinyl, alkylsulfonyl, alkylaminosulfonyl, arylsulfonyl, boryl, borono, boronato, phosphono, phosphonato, phosphinato, phospho, phosphino, or a combination thereof.

3. The composition of claim 1, wherein the at least one olefin metathesis catalyst is a Group 8 transition metal complex having the structure of formula (I)

(I)



in which:

M is a Group 8 transition metal;

L^1, L^2, and L^3 are independently selected from neutral electron donor ligands;

n is 0 or 1, such that L^3 may or may not be present;

m is 0, 1, or 2;

k is 0 or 1;

X^1 and X^2 are independently anionic ligands; and

R^1 and R^2 are independently selected from hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, substituted heteroatom-containing hydrocarbyl, and functional groups; wherein one or both of R^1 and R^2 may have the structure $-(W)_n-U^+V^-$, in which W is selected from hydrocarbylene, substituted hydrocarbylene, heteroatom-containing hydrocarbylene, or substituted heteroatom-containing hydrocarbylene; U is a positively charged Group 15 or Group 16 element substituted with hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, or substituted heteroatom-containing hydrocarbyl; V is a negatively charged counterion; and n is zero or 1,

wherein any two or more of X^1, X^2, L^1, L^2, L^3, R^1, and R^2 can be taken together to form one or more cyclic groups, and further wherein any one or more of X^1, X^2, L^1, L^2, L^3, R^1, and R^2 may be attached to a support.

4. The composition of claim 1, wherein the at least one compound containing at least two isocyanate groups is selected from at least one diisocyanate, triisocyanate, polyisocyanate compound, or mixtures thereof.

5. The composition of claim 1, wherein the at least one adhesion promoter further comprises at least one compound containing at least one heteroatom-containing functional group and at least one metathesis-active olefin.

6. A method for improving the adhesion of a resin composition to a substrate material, comprising:

combining at least one adhesion promoter, at least one cyclic olefin, and at least one olefin metathesis catalyst to form the resin composition,

contacting the resin composition with the substrate material, and

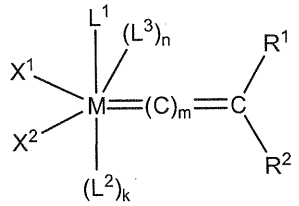
subjecting the resin composition to conditions effective to promote an olefin metathesis reaction of the cyclic olefin,

wherein the at least one adhesion promoter comprises at least one compound containing at least two isocyanate groups.

7. The method of claim 6, wherein the at least one cyclic olefin is selected from strained cyclic olefins, unstrained cyclic olefins, acyclic olefins, dienes, and unsaturated polymers, or combinations thereof, wherein the cyclic olefin may contain a functional group, or be substituted with a group, selected from halogen, hydroxyl, hydrocarbyl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, aralkyloxy, alkaryloxy, acyl, acyloxy, alkoxycarbonyl, alkylcarbonato, arylcarbonato, carboxy, carboxylato, carbamoyl, alkyl-substituted carbamoyl, haloalkyl-substituted carbamoyl, aryl-substituted carbamoyl, thiocarbamoyl alkyl-substituted thiocarbamoyl, aryl-substituted thiocarbamoyl, carbamido, cyano, cyanato, thiocyanato, formyl, thioformyl, amino, alkyl-substituted amino, aryl-substituted amino, alkylamido, arylamido, imino, alkylimino, arylimino, nitro, nitroso, sulfo, sulfonato, alkylsulfanyl, arylsulfanyl, alkylsulfinyl, arylsulfinyl, alkylsulfonyl, alkylaminosulfonyl, arylsulfonyl, boryl, borono, boronato, phosphono, phosphonato, phosphinato, phospho, phosphino, or a combination thereof.

8. The method of claim 6, wherein the at least one olefin metathesis catalyst is a Group 8 transition metal complex having the structure of formula (I)

(I)



in which:

M is a Group 8 transition metal;

L^1, L^2, and L^3 are independently selected from neutral electron donor ligands;

n is 0 or 1, such that L^3 may or may not be present;

m is 0, 1, or 2;

k is 0 or 1;

X^1 and X^2 are independently anionic ligands; and

R^1 and R^2 are independently selected from hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, substituted heteroatom-containing hydrocarbyl,

and functional groups; wherein one or both of R^1 and R^2 may have the structure $-(W)_n-U^+V^-$, in which W is selected from hydrocarbylene, substituted hydrocarbylene, heteroatom-containing hydrocarbylene, or substituted heteroatom-containing hydrocarbylene; U is a positively charged Group 15 or Group 16 element substituted with hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, or substituted heteroatom-containing hydrocarbyl; V is a negatively charged counterion; and n is zero or 1,
wherein any two or more of X^1, X^2, L^1, L^2, L^3, R^1, and R^2 can be taken together to form one or more cyclic groups, and further wherein any one or more of X^1, X^2, L^1, L^2, L^3, R^1, and R^2 may be attached to a support.

9. The method of claim 6, wherein the at least one compound containing at least two isocyanate groups is selected from at least one diisocyanate, triisocyanate, polyisocyanate compound, or mixtures thereof.

10. The method of claim 6, wherein the at least one adhesion promoter further comprises at least one compound containing at least one heteroatom-containing functional group and at least one metathesis-active olefin.

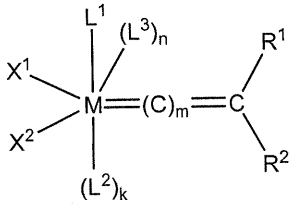
11. An article of manufacture comprising at least one resin composition containing at least one cyclic olefin, at least one olefin metathesis catalyst, and at least one adhesion promoter comprising at least one compound containing at least two isocyanate groups.

12. The article of manufacture of claim 11, wherein the at least one cyclic olefin is selected from strained cyclic olefins, unstrained cyclic olefins, acyclic olefins, dienes, and unsaturated polymers, or combinations thereof, wherein the cyclic olefin may contain a functional group, or be substituted with a group, selected from halogen, hydroxyl, hydrocarbyl, alkoxy, alkenyloxy, alkynyloxy, aryloxy, aralkyloxy, alkaryloxy, acyl, acyloxy, alkoxycarbonyl, alkylcarbonato, arylcarbonato, carboxy, carboxylato, carbamoyl, alkyl-substituted carbamoyl, haloalkyl-substituted carbamoyl, aryl-substituted carbamoyl, thiocarbamoyl alkyl-substituted thiocarbamoyl, aryl-substituted thiocarbamoyl, carbamido, cyano, cyanato, thiocyanato, formyl, thioformyl, amino, alkyl-substituted amino, aryl-substituted amino, alkylamido, arylamido, imino, alkylimino, arylimino, nitro, nitroso, sulfo, sulfonato, alkylsulfanyl, arylsulfanyl,

alkylsulfinyl, arylsulfinyl, alkylsulfonyl, alkylaminosulfonyl, arylsulfonyl, boryl, borono, boronato, phosphono, phosphonato, phosphinato, phospho, phosphino, or a combination thereof.

13. The article of manufacture of claim 11, wherein the at least one olefin metathesis catalyst is a Group 8 transition metal complex having the structure of formula (I)

(I)



in which:

M is a Group 8 transition metal;

L^1, L^2, and L^3 are independently selected from neutral electron donor ligands;

n is 0 or 1, such that L^3 may or may not be present;

m is 0, 1, or 2;

k is 0 or 1;

X^1 and X^2 are independently anionic ligands; and

R^1 and R^2 are independently selected from hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, substituted heteroatom-containing hydrocarbyl, and functional groups; wherein one or both of R^1 and R^2 may have the structure $-(W)_n-U^+V^-$, in which W is selected from hydrocarbylene, substituted hydrocarbylene, heteroatom-containing hydrocarbylene, or substituted heteroatom-containing hydrocarbylene; U is a positively charged Group 15 or Group 16 element substituted with hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom-containing hydrocarbyl, or substituted heteroatom-containing hydrocarbyl; V is a negatively charged counterion; and n is zero or 1,

wherein any two or more of X^1, X^2, L^1, L^2, L^3, R^1, and R^2 can be taken together to form one or more cyclic groups, and further wherein any one or more of X^1, X^2, L^1, L^2, L^3, R^1, and R^2 may be attached to a support.

14. The article of manufacture of claim 11, wherein the at least one compound containing at least two isocyanate groups is selected from at least one diisocyanate, triisocyanate, polyisocyanate compound, or mixtures thereof.

15. The article of manufacture of claim 11, wherein the at least one adhesion promoter further comprises at least one compound containing at least one heteroatom-containing functional group and at least one metathesis-active olefin.

16. Use of at least one compound containing at least two isocyanate groups as an adhesion promoter for adhering a metathesis-polymerized resin composition to a substrate material.

17. A method for modifying the onset of a ROMP reaction of a cyclic olefin catalyzed by an olefin metathesis catalyst, comprising:

combining a hydroperoxide gel modifier with a cyclic olefin and an olefin metathesis catalyst, thereby forming a ROMP composition, and

subjecting the ROMP composition to conditions effective to promote a ROMP reaction of the cyclic olefin in the presence of the olefin metathesis catalyst and the added hydroperoxide gel modifier,

wherein the hydroperoxide is added in an amount effective to increase the gel time of the ROMP reaction of the cyclic olefin catalyzed by the olefin metathesis catalyst in the absence of the added hydroperoxide.