objects such as, for example, automobiles, buses, boats, trains, other vehicles, aircrafts, bridges, signage, buildings, sidewalks, roads, subterranean pipelines and equipment, and petrochemical and chemical production equipment, to suffer from changes in quality over time leading to deterioration or failure of the object.

[0007] Corrosion is so widespread and so costly to repair, it is recommended to take effective precautionary measures when it comes to corrosion prevention.

[0008] One of the best ways to prevent corrosion is to apply a protective coating. Such a protective coating protects its substrate by preventing contact between the substrate and harsh environments (atmospheric, chemical, etc.).

[0009] Therefore, over the years there has been an ongoing need for coating compositions (e.g., anti-corrosion coating compositions) which provide surface protection to objects from corrosive materials or damaging environmental conditions.

[00010] Most pipes and pipelines used in petrochemical and chemical production operations are constructed of metal, typically some grade of steel, and many are jacketed in insulation. If during installation of the pipe or pipeline the insulation material covering the pipe or pipeline becomes damaged or degrades over time, the underlying surface of the pipe or pipeline is now at risk of being in direct contact with the atmospheric environment, which may lead to a host of problems including premature failure of the pipe or pipeline resulting in increased repair and/or replacement costs.

[00011] Therefore, there is a need for an underlying coating applied to the pipe or pipeline surface, between the pipe or pipeline surface and the insulation material, which will act as an anti-corrosion barrier in case the insulation material is damaged or degrades. This need has led to the introduction of a number of coating compositions for the purpose of protecting steel pipelines and structures.

[00012] Epoxy, polyamide and polyurethane based coating compositions have been used extensively to prevent corrosion of steel pipelines and structures.

[00013] The industry has relied on 2K epoxies, however, liquid 2-part epoxies typically require long cure cycles and are not as conducive to rapid coating operations that facilitate manufacturing.

[00014] Despite advances achieved in the art in the area of coating compositions, particularly anti-corrosion coating compositions for coating pipelines and structures, a continuing need exists for further improvements.

~~BRIEF~~ SUMMARY ~~OF THE DISCLOSURE~~

[00015] The present ~~invention~~disclosure is directed to addressing one or more of the aforementioned concerns and relates to coating compositions and methods for coating substrates with the coating compositions of the ~~invention~~disclosure. The coating compositions of the ~~invention~~disclosure may be used for a variety of purposes, including without limitation, decoration; improving the barrier properties of packaging; protection of substrate

~~[00015]~~ materials which can be: metals such as steel, stainless steel, aluminum, copper, iron, nickel, titanium, silver, or nonmetals such as glass, concrete, ceramics, porcelain, brick, stone, plastics, rubber, wood, cloth, fabrics, or composites such as reinforced plastics, electronic assemblies; and/or protection of substrate surfaces from time wise changes in quality, or deterioration, due to environmental exposure. In other words, coating compositions of the ~~invention~~disclosure may be applied to substrate surfaces to provide protection, including anti-corrosion protection, against deterioration of the substrate material and/or substrate surface due to environmental exposure.

[00016] Coating compositions of the ~~invention~~disclosure may also be used as adhesives.

[00017] In particular, the present ~~invention~~disclosure provides coating compositions for coating pipes, pipelines, and structures used in petrochemical and chemical production operations to provide an anti-corrosion barrier against deterioration of the underlying pipe, pipeline, equipment, structure, or object due to environmental exposure and other corrosive materials. The coatings of the ~~invention~~disclosure provide a constant protective lining that helps save pipes from the damaging effects of corrosion. Pipeline coating is one of the most reliable corrosion prevention methods used by industries today.

[00018] The coating compositions of the ~~invention~~disclosure offer several advantages over the prior art materials used for providing a protective coating on pipes, pipelines, equipment, structures, and objects used in petrochemical and chemical production operations.

[00019] In particular, coating compositions of the ~~invention~~disclosure may be formulated to meet a wide variety of application conditions and needs.

[00020] As an example of one advantage, the coating compositions of the ~~invention~~disclosure are designed to provide long term corrosion inhibition by serving as an impermeable barrier to oxygen, water, ions, etc. The coating compositions of the ~~invention~~disclosure are not porous. The coating compositions of the ~~invention~~disclosure can be applied and cured in high humidity conditions and at colder temperatures than common coatings.

[00021] As an example of another advantage, the coating compositions of the ~~invention~~disclosure can be formulated to have a wide range of tunable cure times.

[00022] For example, the coating compositions of the ~~invention~~disclosure may be formulated to cure quickly (“fast cure”) so that they dry to the touch rapidly after being applied to the substrate surface. A fast-cure coating composition of the ~~invention~~disclosure has rapid dry to touch time of less than 20 minutes, preferably less than 10 minutes and more preferably less than 1 minute, even within seconds of being applied to a surface. An article coated with a fast-cure composition of the ~~invention~~disclosure is handleable and has a durable coating in less than 60 minutes, preferably less than 30 minutes and more preferably in 10 minutes or less after application. In comparison, liquid epoxies typically take many hours to cure.

[00023] As an example of another advantage, the coating compositions of the ~~invention~~disclosure are solvent free.

[00024] As an example of another advantage, the coating compositions of the ~~invention~~disclosure are resistant to cracking and delamination in hot/wet aqueous environments.

[00025] The coating compositions of the ~~invention~~disclosure can be prepared by different chemical transformations and can be processed by a variety of methods.

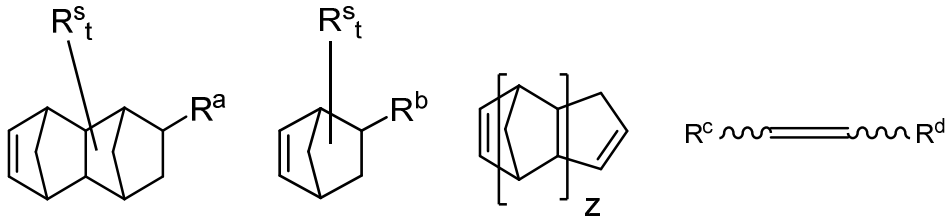
[00026] In one ~~embodiment~~example, the ~~invention~~disclosure provides coating compositions cured by ring opening metathesis polymerization (ROMP) comprising reacting at least one cyclic olefin with at least one metal carbene olefin metathesis catalyst.

[00027] The coating compositions of the ~~invention~~disclosure may also be cured by vinyl/addition copolymerization of cyclic olefins, optionally with at least one linear olefin, with at least one organometallic catalyst (Progress in Polymer Science 84 (2018) 1–46, Coordination Chemistry Reviews 253 (2009) 827–861). The organometallic complexes suitable for such vinyl/addition polymerization of the cyclic olefins of the ~~invention~~disclosure are comprised of a transition metal, generally a late transition metal, typically palladium or nickel, ligated by monodentate or chelating nitrogen, oxygen, or phosphorous ligands. These complexes may be activated by a cocatalyst such as methylaluminoxane (MAO), tris(pentafluorophenyl)borane, or other Lewis acids.

[00028] Alternatively, the coating compositions of the ~~invention~~disclosure may also be cured by free radical polymerization (The Journal of American Science, 4(1), 2008, 1545-1003). Initiators suitable for such radical addition polymerization of the cyclic olefins of the ~~invention~~disclosure are azo compounds including azobisisobutyronitrile (AIBN), organic hydroperoxides including tert-butyl hydroperoxide and cumene hydroperoxide, organic diperoxides including benzoyl peroxide and tert-butyl peroxide, alkoxyamines including (2,2,6,6-tetramethylpiperidin-1-yl)oxyl (TEMPO) and N-tert-Butyl-N-(2-methyl-1-phenylpropyl)-O-(1-phenylethyl)hydroxylamine, and boron amine complexes such as triethylborane-1,3-diaminopropane complex and tri-n-butylborane-3-methoxy-1-propylamine complex. Radical cation initiators may also be employed, including hypervalent iodine activators such as diaryliodonium salts and (diacetoxyiodo)benzene.

[00029] In another ~~embodiment~~example, the coating compositions of the ~~invention~~disclosure may be cured by cationic polymerization (Macromolecules 47 (2014) 5470–5483) of at least one cyclic olefin, optionally with at least one linear olefin, with at least one radical or cationic initiator. The activators suitable for such cationic polymerization of the cyclic olefins of the ~~invention~~disclosure are Lewis acids including boron trifluoride, aluminum trichloride, titanium tetrachloride, and tin tetrachloride, optionally activated by an initiator including water, hydrogen chloride, and octanoic acid. Organometallic catalysts suitable for promoting cationic polymerization of the monomers of the ~~invention~~disclosure are metallocene catalysts including Cp^*TiCl_3 and Cp_2AlMe activated by Lewis acids including tris(pentafluorophenyl)borane.

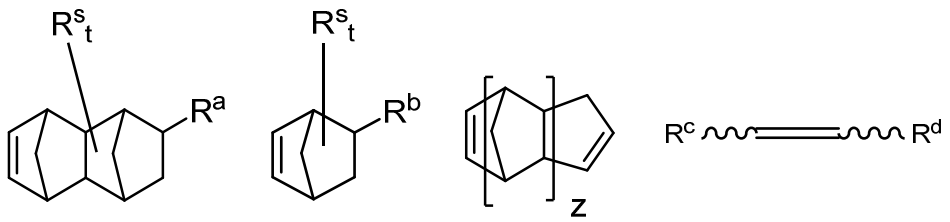
[00030] A coating composition of the ~~invention~~disclosure may comprise, consist essentially of, or consist of at least one cyclic olefin selected from the group consisting of **Formulae (I)**, **(II)**, and **(III)**; optionally at least one linear olefin of **Formula (IV)**; at least one coating additive; and at least one curing agent selected from an organometallic complex, a free radical initiator and a cationic initiator, preferably at least one metal carbene metathesis catalyst curing agent. The cyclic olefin of **Formulae (I)**, **(II)**, and **(III)**, and the linear olefin of **Formula (IV)** have the following structures:



Formula (I), **Formula (II)**, **Formula (III)**, **Formula (IV)**. The cyclic olefins of **Formulae (I)**, **(II)**, and **(III)**, and the linear olefins of **Formula (IV)** are described below.

[00031] The ~~invention~~disclosure also provides a method for coating a substrate material, comprising the steps of optionally applying an adhesion promoter onto the substrate surface; applying onto the substrate surface a coating composition comprising, consisting essentially of or consisting of at least one cyclic olefin selected from the group consisting of **Formulae (I)**, **(II)**, and **(III)**; optionally at least one linear olefin of **Formula (IV);** at least one coating additive; and at least one curing agent selected from an organometallic complex, a free radical initiator and a cationic initiator, preferably at least one metal carbene metathesis catalyst curing agent; and curing the coating applied on the substrate surface.

[00031a] In one aspect, the present disclosure refers to a coating composition comprising, consisting essentially of, or consisting of: at least one cyclic olefin selected from the group consisting of **Formulae (I)**, **(II)**, and **(III)**; optionally at least one linear olefin of **Formula (IV)**; and at least one curing agent selected from an organometallic complex, a free radical initiator and a cationic initiator; wherein the cyclic olefin of **Formulae (I)**, **(II)**, and **(III)**, and the linear olefin of **Formula (IV)** have the following structures:



Formula (I), **Formula (II)**, **Formula (III)**, **Formula (IV)**, wherein:

R^a is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^b is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-Si(OR^k)_3$ $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, spiro optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^c is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, CN, NO_2, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^d is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, CN, NO_2, $-CF_3-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

each R^s is independently optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally

substituted C_{3-12} cycloalkenyl, -CH_2-(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

t is 0, 1, 2, 3, 4, 5, or 6;

R^f is OH, OR^k, NR^gR^h, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^g is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, optionally substituted linear or branched C_{2-24} alkenyl, -C(O)-(optionally substituted C_{5-24} aryl), -C(O)-(optionally substituted linear or branched C_{2-24} alkenyl), or optionally substituted C_{3-12} cycloalkenyl;

R^h is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^i is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^j is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^k is optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^l is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^m is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^n is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^o is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

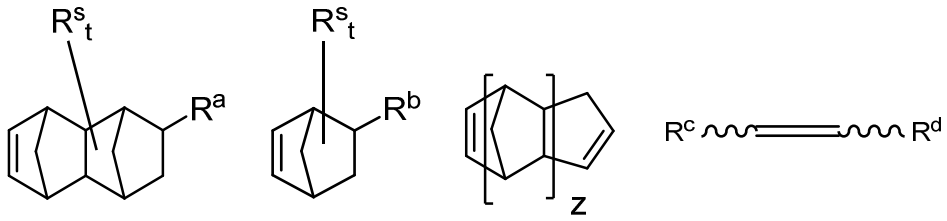
R^p is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl; and

z is 0, 1, 2, or 3.;

wherein the coating composition contains 0.01 to 95 percent by weight of an inorganic filler selected from aluminum powder or alloys thereof, aluminum flakes or alloys thereof, micaceous iron oxide, and mixtures thereof.

[00031b] In a further aspect, the present disclosure refers to a method for coating a substrate material, comprising: optionally applying an adhesion promoter onto the substrate surface; applying onto the substrate surface a coating composition comprising, consisting essentially of or consisting of: at least one cyclic olefin selected from the group consisting of Formulae (I), (II), and (III), optionally at least one linear olefin of Formula (IV); at least one coating additive; and at least one curing agent selected from an organometallic complex, a free radical initiator and a cationic initiator;

wherein the cyclic olefin of Formulae (I), (II), and (III), and the linear olefin of Formula (IV) have the following structures:



Formula (I), **Formula (II)**, **Formula (III)**, **Formula (IV)**;

wherein:

R^a is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, $-CN$, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^b is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-Si(OR^k)_3$ $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, spiro optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^c is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, CN, NO_2, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^d is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, CN, NO_2, $-CF_3-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

each R^s is independently optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

t is 0, 1, 2, 3, 4, 5, or 6;

R^f is OH, OR^k, NR^gR^h, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^g is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, optionally substituted linear or branched C_{2-24} alkenyl, -C(O)-(optionally substituted C_{5-24} aryl), -C(O)-(optionally substituted linear or branched C_{2-24} alkenyl), or optionally substituted C_{3-12} cycloalkenyl;

R^h is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^i is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^j is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^k is optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^l is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^m is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^n is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^o is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^p is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl; and

z is 0, 1, 2, or 3;

and at least one metal carbene metathesis catalyst, and at least one additive; and

~~[00031]~~ curing at room temperature the coating applied on the substrate surface.

[00032] In yet another aspect, the present disclosure refers to ~~The invention further relates to~~an article~~s~~ of manufacture produced by a method ~~of the invention~~as described herein. In still a further aspect, the present disclosure refers to ~~A~~an article of manufacture ~~of the invention has~~comprising a substrate coated with a cured coating composition ~~of the invention~~wherein the coating composition is a coating composition as described herein.

DETAILED DESCRIPTION OF THE DISCLOSURE

Terminology and Definitions

[00033] Unless otherwise indicated, the invention is not limited to specific reactants, substituents, catalysts, metal carbene olefin metathesis catalysts, catalyst compositions, olefins, cyclic olefin compositions, coating compositions, reaction conditions, or the like, as such may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only and is not to be interpreted as being limiting.

[00034] In this specification and in the claims that follow, reference will be made to a number of terms, which shall be defined to have the meanings as described herein.

The claimed invention is:

1. A coating composition comprising, consisting essentially of, or consisting of:

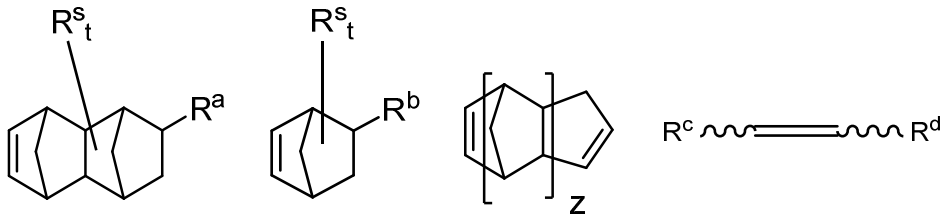
at least one cyclic olefin selected from the group consisting of **Formulae (I)**, **(II)**, and **(III)**;

optionally at least one linear olefin of **Formula (IV)**;

~~at least one coating additive;~~ and

at least one curing agent selected from an organometallic complex, a free radical initiator and a cationic initiator;

wherein the cyclic olefin of **Formulae (I)**, **(II)**, and **(III)**, and the linear olefin of **Formula (IV)** have the following structures:



Formula (I), **Formula (II)**, **Formula (III)**, **Formula (IV)**, wherein:

R^a is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^b is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-Si(OR^k)_3$ $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, spiro optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^c is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, CN, NO_2, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted

heterocycle), optionally substituted C_{3-10} cycloalkyl, -CH_2-(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, -CH_2-(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, -CH_2-(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^d is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, - $C(O)R^f$, -CH_2-$C(O)R^f$, - OR^g, -CH_2-OR^g, CN, NO_2, -CF_3-$P(O)(OR^h)_2$, -$OP(O)(OR^h)_2$, -$S(O)_2OR^h$, -$OS(O)_2R^h$, optionally substituted heterocycle, -CH_2-(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, -CH_2-(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, -CH_2-(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, -CH_2-(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

each R^s is independently optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, -CH_2-$C(O)R^f$, -OR^g, -CH_2-OR^g, -CN, -NO_2, -CF_3, -$P(O)(OR^h)_2$, -$OP(O)(OR^h)_2$, -$S(O)_2OR^h$, -$OS(O)_2R^h$, optionally substituted heterocycle, -CH_2-(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, -CH_2-(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, -CH_2-(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, -CH_2-(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

t is 0, 1, 2, 3, 4, 5, or 6;

R^f is OH, OR^k, NR^gR^h, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^g is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, optionally substituted linear or branched C_{2-24} alkenyl, -C(O)-(optionally substituted C_{5-24} aryl), -C(O)-(optionally substituted linear or branched C_{2-24} alkenyl), or optionally substituted C_{3-12} cycloalkenyl;

R^h is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^i is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^j is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^k is optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^l is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^m is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^n is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^o is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^p is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl; and

z is 0, 1, 2, or 3~~.~~;

wherein the coating composition contains 0.01 to 95 percent by weight of an inorganic filler selected from aluminum powder or alloys thereof, aluminum flakes or alloys thereof, micaceous iron oxide, and mixtures thereof.

2. The coating composition of claim 1, wherein:

R^a is H, optionally substituted linear or branched C_{1-12} alkyl, optionally substituted linear or branched C_{2-6} alkenyl, halogen, $-C(O)R^f$, $-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{6-10} aryl, optionally substituted C_{3-12} cycloalkenyl;

R^b is H, optionally substituted linear or branched C_{1-12} alkyl, optionally substituted linear or branched C_{2-6} alkenyl, halogen, $-C(O)R^f$, $-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$,

$-OS(O)_2R^h$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{6-10} aryl, optionally substituted C_{3-12} cycloalkenyl;

R^c is H, optionally substituted linear or branched C_{1-12} alkyl, optionally substituted linear or branched C_{2-6} alkenyl, halogen, $-C(O)R^f$, $-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{6-10} aryl, optionally substituted C_{3-12} cycloalkenyl;

R^d is H, optionally substituted linear or branched C_{1-12} alkyl, optionally substituted linear or branched C_{2-6} alkenyl, halogen, $-C(O)R^f$, $-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{6-10} aryl, optionally substituted C_{3-12} cycloalkenyl;

t is 0;

R^f is OH, OR^k, NR^gR^h, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^g is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^h is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

z is 2;

R^i is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^j is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^k is optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^l is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^m is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^n is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^o is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl; and

R^p is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl.

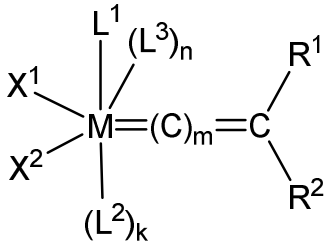
3. The coating composition of claim 1 or claim 2, wherein

the cyclic olefin of formula (I) is ENB-DDA, HNB-DDA, or a mixture thereof;

the cyclic olefin of formula (II) is HENB, NBCbSi, ONB, NB-methanol, NB-dimethanol, NB-epoxide, NB-triethoxysilane, NB-Fluorocarbon (1), NB-fluorocarbon (2), NB-fluorocarbon (3), or a mixture thereof; and

the cyclic olefin of formula (III) is TCPD, DCPD, or a mixture thereof.

4. The coating composition of any one of claims 1-3, wherein the at least one curing agent is at least one metal carbene metathesis catalyst having the structure of **Formula (1)**:



Formula (1),

wherein:

M is ruthenium;

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

n is 0 or 1;

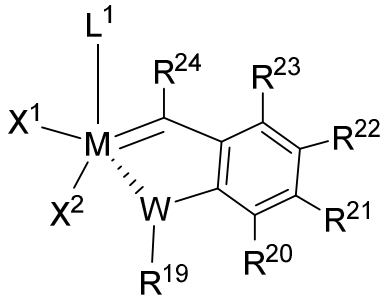
m is 0, 1, or 2;

k is 0 or 1;

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

R^1 and R^2 are independently hydrogen, optionally substituted hydrocarbyl, optionally substituted heteroatom-containing hydrocarbyl; or R^1 and R^2 are linked together to form one or more cyclic groups.

5. The coating composition of any of claims 1-4, wherein the at least one curing agent is at least one metal carbene metathesis catalyst having the structure of **Formula (2)**



Formula (2)

wherein:

M is ruthenium;

L^1 is a neutral electron donor ligand;

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

W is O, halogen, NR^{33} or S;

R^{19} is H, optionally substituted C_{1-24} alkyl, $-C(R^{34})(R^{35})COOR^{36}$, $-C(R^{34})(R^{35})C(O)H$, $-C(R^{34})(R^{35})C(O)R^{37}$, $-C(R^{34})(R^{35})CR^{38}(OR^{39})(OR^{40})$, $-C(R^{34})(R^{35})C(O)NR^{41}R^{42}$, $-C(R^{34})(R^{35})C(O)NR^{41}OR^{40}$, $-C(O)R^{25}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or when W is NR^{33}, then R^{19} together with R^{33} can form an optionally substituted heterocyclic ring or when W is halogen then R^{19} is nil;

R^{20} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl or together with R^{21} can form a polycyclic ring;

R^{21} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl or together with R^{20} or together with R^{22} can form a polycyclic ring;

R^{22} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl or together with R^{21} or together with R^{23} can form a polycyclic ring;

R^{23} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl or together with R^{22} can form a polycyclic ring;

R^{24} is H, optionally substituted C_{1-24} alkyl, halogen, - $C(O)R^{25}$, - OR^{26}, CN, - $NR^{27}R^{28}$, NO_2, -CF_3, $–S(O)_xR^{29}$, -$P(O)(OH)_2$, -$OP(O)(OH)_2$, -SR^{31}, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{25} is OH, OR^{30}, $NR^{27}R^{28}$, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{26} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{27} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{28} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{29} is H, optionally substituted C_{1-24} alkyl, OR^{26}, - $NR^{27}R^{28}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{30} is optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{31} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{33} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{34} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{35} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{36} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{37} is optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{38} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{39} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{40} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{41} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{42} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl; and

x is 1 or 2.

6. The coating composition of one of claims 1-4, wherein the coating composition comprises at least one cyclic olefin represented selected from the group consisting of **Formulae (I)** and **(II)**.

7. The coating composition of any of claims 1-4, wherein the coating composition comprises at least one cyclic olefin selected from the group consisting of **Formulae (I)** and **(III)**.

8. The coating composition of any of claims 1-4, wherein the coating composition comprises at least one cyclic olefin selected from the group consisting of **Formulae (II)** and **(III)**.

9. The coating composition of any of claims 1-8, wherein the coating composition further comprises a coating additive ~~is~~ selected from the group consisting of a gel modifier, a hardness modulator, an impact modifier, an antioxidant, an antiozonant, a filler, a binder, a thixotrope, a rheology modifier, a dispersant, a wetting agent, a plasticizer, a pigment, a flame retardant, a dye, fibers, a reinforcement material, a coupling agent, a UV absorber, a UV light stabilizer, a film former, a lubricant, an adhesion promoter and mixtures thereof.

10. The coating composition of ~~any of~~ claim 9~~s 1-8~~, wherein the coating additive is selected from the group consisting of a filler, rheology modifier, a coupling agent, a UV absorber, a UV light stabilizer, an adhesion promoter and mixtures thereof.

11. The coating composition of any of claims 1-10, wherein the ~~coating composition contains a filler and the filler is an~~ inorganic filler ~~present in an amount of about 0.01 to about 95 percent by weight~~is selected from aluminum powder or alloys thereof, aluminum flakes or alloys thereof, and mixtures thereof.

12. A method for coating a substrate material, comprising:

optionally applying an adhesion promoter onto the substrate surface;

applying onto the substrate surface a coating composition comprising, consisting essentially of or consisting of:

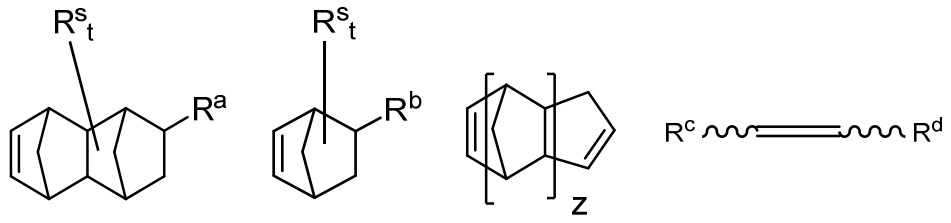
at least one cyclic olefin selected from the group consisting of **Formulae (I)**, **(II)**, and **(III)**, optionally at least one linear olefin of **Formula (IV);**

at least one coating additive;

and

at least one curing agent selected from an organometallic complex, a free radical initiator and a cationic initiator;

wherein the cyclic olefin of **Formulae (I)**, **(II)**, and **(III)**, and the linear olefin of **Formula (IV)** have the following structures:



Formula (I), **Formula (II)**, **Formula (III)**, **Formula (IV)**;

wherein:

R^a is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^b is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-Si(OR^k)_3$ $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, spiro optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl),

$C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^c is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, CN, NO_2, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

R^d is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, CN, NO_2, $-CF_3-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

each R^s is independently optionally substituted linear or branched C_{1-24} alkyl, optionally substituted linear or branched C_{2-24} alkenyl, halogen, $-C(O)R^f$, $-CH_2-C(O)R^f$, $-OR^g$, $-CH_2-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, $-CH_2-$(optionally substituted heterocycle), optionally substituted C_{3-10} cycloalkyl, $-CH_2-$(optionally substituted C_{3-10} cycloalkyl), optionally substituted C_{5-24} aryl, $-CH_2-$(optionally substituted C_{5-24} aryl), optionally substituted C_{3-12} cycloalkenyl, $-CH_2-$(optionally substituted C_{3-12} cycloalkenyl), $C(R^h)(R^i)COOR^j$, $-C(R^h)(R^i)C(O)H$, $-C(R^h)(R^i)C(O)R^k$, $-C(R^h)(R^i)CR^l(OR^m)(OR^n)$, $-C(R^h)(R^i)C(O)NR^oR^p$, $-C(R^h)(R^i)C(O)NR^oOR^n$;

t is 0, 1, 2, 3, 4, 5, or 6;

R^f is OH, OR^k, NR^gR^h, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^g is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, optionally substituted linear or branched C_{2-24} alkenyl, $-C(O)-$(optionally substituted C_{5-24} aryl), $-C(O)-$(optionally substituted linear or branched C_{2-24} alkenyl), or optionally substituted C_{3-12} cycloalkenyl;

R^h is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^i is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^j is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^k is optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^l is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^m is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^n is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^o is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^p is H, optionally substituted linear or branched C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-12} cycloalkenyl; and

z is 0, 1, 2, or 3;

and at least one metal carbene metathesis catalyst, and at least one additive; and

curing at room temperature the coating applied on the substrate surface.

13. The method of claim 12, wherein:

R^a is H, optionally substituted linear or branched C_{1-12} alkyl, optionally substituted linear or branched C_{2-6} alkenyl, halogen, $-C(O)R^f$, $-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{6-10} aryl, optionally substituted C_{3-12} cycloalkenyl;

R^b is H, optionally substituted linear or branched C_{1-12} alkyl, optionally substituted linear or branched C_{2-6} alkenyl, halogen, $-C(O)R^f$, $-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{6-10} aryl, optionally substituted C_{3-12} cycloalkenyl;

R^c is H, optionally substituted linear or branched C_{1-12} alkyl, optionally substituted linear or branched C_{2-6} alkenyl, halogen, $-C(O)R^f$, $-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{6-10} aryl, optionally substituted C_{3-12} cycloalkenyl;

R^d is H, optionally substituted linear or branched C_{1-12} alkyl, optionally substituted linear or branched C_{2-6} alkenyl, halogen, $-C(O)R^f$, $-OR^g$, -CN, $-NO_2$, $-CF_3$, $-P(O)(OR^h)_2$, $-OP(O)(OR^h)_2$, $-S(O)_2OR^h$, $-OS(O)_2R^h$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{6-10} aryl, optionally substituted C_{3-12} cycloalkenyl;

t is 0;

R^f is OH, OR^k, NR^gR^h, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^g is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^h is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

z is 2;

R^i is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^j is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^k is optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^l is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^m is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^n is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl;

R^o is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl; and

R^p is H, optionally substituted C_{1-12} alkyl, optionally substituted C_{3-8} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{6-10} aryl, or optionally substituted C_{3-12} cycloalkenyl.

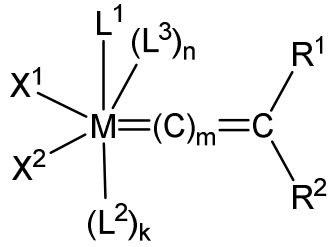
14. The method of claim 12 or claim 13, wherein

the cyclic olefin of formula (I) is ENB-DDA, HNB-DDA, or a mixture thereof;

the cyclic olefin of formula (II) is HENB, NBCbSi, ONB, NB-methanol, NB-dimethanol, NB-epoxide, NB-triethoxysilane, NB-Fluorocarbon (1), NB-fluorocarbon (2), NB-fluorocarbon (3), or a mixture thereof; and

the cyclic olefin of formula (III) is TCPD, DCPD, or a mixture thereof.

15. The method of any of claims 12-14, wherein the at least one curing agent is at least one metal carbene olefin metathesis catalyst having the structure of **Formula (1)**:



Formula (1),

wherein:

M is ruthenium;

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

n is 0 or 1;

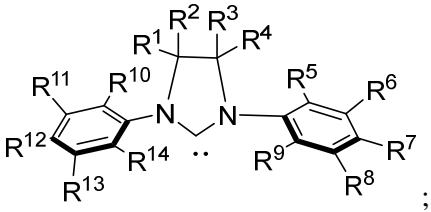
m is 0, 1, or 2;

k is 0 or 1;

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

R^1 and R^2 are independently hydrogen, unsubstituted hydrocarbyl, substituted hydrocarbyl, unsubstituted heteroatom-containing hydrocarbyl, or substituted heteroatom-containing hydrocarbyl; or R^1 and R^2 are linked together to form one or more cyclic groups.

16. The method of claim 15, wherein:

L^1 is ;

R^1 is H, optionally substituted C_{1-24} alkyl, halogen, - $C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^2 can form a spiro compound, or together with R^3 or together with R^4 can form a polycyclic ring;

R^2 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl or together with R^1 can form a spiro compound, or together with R^3 or together with R^4 can form a polycyclic ring;

R^3 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^2 or together with R^1 can form a polycyclic ring, or together with R^4 can form a spiro compound;

R^4 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^3 can form a spiro compound, or together with R^2 or together with R^1 can form a polycyclic ring;

R^5 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^6 can form an optionally substituted polycyclic ring;

R^6 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^5 or together with R^7 can form an optionally substituted polycyclic ring;

R^7 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl optionally substituted C_{3-8} cycloalkenyl, or together with R^6 or together with R^8 can form an optionally substituted polycyclic ring;

R^8 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^7 or together with R^9 can form an optionally substituted polycyclic ring;

R^9 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^8 can form an optionally substituted polycyclic ring;

R^{10} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^{11} can form an optionally substituted polycyclic ring;

R^{11} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^{10} or together with R^{12} can form an optionally substituted polycyclic ring;

R^{12} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^{11} or together with R^{13} can form an optionally substituted polycyclic ring;

R^{13} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^{14} or together with R^{12} can form an optionally substituted polycyclic ring;

R^{14} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^{13} can form a polycyclic ring;

R^{25} is -OH, $-OR^{30}$, $-NR^{27}R^{28}$, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{26} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{27} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{28} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{29} is H, optionally substituted C_{1-24} alkyl, $-OR^{26}$, $-NR^{27}R^{28}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{30} is optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{31} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl; and

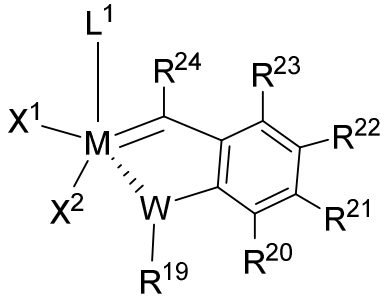
x is 1 or 2.

17. The method of claim 15 or claim 16, wherein: L^2 is $PR^{H1}R^{H2}R^{H3}$ wherein: R^{H1}, R^{H2}, and R^{H3} are each independently optionally substituted C_6-C_{10} aryl, optionally substituted C_1-C_{10} alkyl, or optionally substituted C_3-C_{10} cycloalkyl.

18. The method of any of claims 15-17, wherein: R^1 is hydrogen and R^2 is phenyl; or R^1 is hydrogen and R^2 is 3-methyl-1-propenyl; or R^1 and R^2 are linked together to form 3-phenylindenylid-1-ene.

19. The method of claim 18, wherein: R^{H1} is phenyl, ethyl, or cyclohexyl, R^{H2} is phenyl or cyclohexyl, and R^{H3} is phenyl, ethyl, or cyclohexyl.

20. The method of any of claims 12-19, wherein the at least one curing agent is at least one metal carbene metathesis catalyst having the structure of **Formula (2)**



Formula (2)

wherein:

M is ruthenium;

L^1 is a neutral electron donor ligand;

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

W is O, halogen, NR^{33} or S;

R^{19} is H, optionally substituted C_{1-24} alkyl, $-C(R^{34})(R^{35})COOR^{36}$, $-C(R^{34})(R^{35})C(O)H$, $-C(R^{34})(R^{35})C(O)R^{37}$, $-C(R^{34})(R^{35})CR^{38}(OR^{39})(OR^{40})$, $-C(R^{34})(R^{35})C(O)NR^{41}R^{42}$, $-C(R^{34})(R^{35})C(O)NR^{41}OR^{40}$, $-C(O)R^{25}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or when W is NR^{33}, then R^{19} together with R^{33} can form an optionally substituted heterocyclic ring or when W is halogen then R^{19} is nil;

R^{20} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl or together with R^{21} can form a polycyclic ring;

R^{21} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl or together with R^{20} or together with R^{22} can form a polycyclic ring;

R^{22} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl or together with R^{21} or together with R^{23} can form a polycyclic ring;

R^{23} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl or together with R^{22} can form a polycyclic ring;

R^{24} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{25} is OH, OR^{30}, $NR^{27}R^{28}$, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{26} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{27} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{28} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{29} is H, optionally substituted C_{1-24} alkyl, OR^{26}, - $NR^{27}R^{28}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{30} is optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{31} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{33} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{34} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{35} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{36} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{37} is optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{38} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{39} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{40} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{41} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl;

R^{42} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl; and

x is 1 or 2.

21. The method of any of claims 12-20, wherein the coating composition comprises at least one cyclic olefin represented selected from the group consisting of **Formulae (I)** and **(II)**.

22. The method of any of claims 12-20, wherein the coating composition comprises at least one cyclic olefin selected from the group consisting of **Formulae (I)** and **(III)**.

23. The method of any of claims 12-20, wherein the coating composition comprises at least one cyclic olefin selected from the group consisting of **Formulae (II)** and **(III)**.

24. The method of any of claims 12-23, wherein the coating composition additive is selected from the group consisting of a gel modifier, a hardness modulator, an impact modifier, an antioxidant, an antiozonant, a filler, a binder, a thixotrope, a rheology modifier, a dispersant, a wetting agent, a plasticizer, a pigment, a flame retardant, a dye, fibers, a reinforcement material, a coupling agent, a UV absorber, a UV light stabilizer, a film former, a lubricant, an adhesion promoter and mixtures thereof.

25. The method of any of claims 12-23, wherein the coating composition additive is selected from the group consisting of a filler, rheology modifier, a coupling agent, a UV absorber, a UV light stabilizer, an adhesion promoter and mixtures thereof.

26. The method of any of claims 12-23, wherein the coating composition contains a filler and the filler is an inorganic filler present in an amount of ~~about~~ 0.01 to ~~about~~ 95 percent by weight.

27. The method of any of claims 12-26, further comprising the step of adhering a second substrate by placing a second substrate on the coated substrate to adhere the two substrates together.

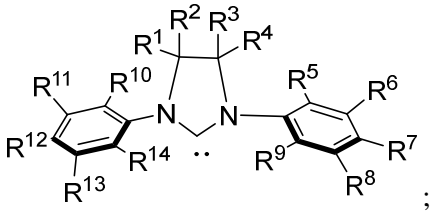
28. An article of manufacture produced by the method of any of claims 12-27.

29. An article of manufacture comprising a substrate coated with a cured coating composition wherein the coating composition is a coating composition of any of claims 1-11.

30. An article of manufacture of claim 29, wherein the substrate is a metal surface.

31. An article of manufacture of claim 29, wherein the substrate is a nonmetal surface.

32. The coating composition of claim 4, wherein:

L^1 is  ;

R^1 is H, optionally substituted C_{1-24} alkyl, halogen, - $C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, - $S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^2 can form a spiro compound, or together with R^3 or together with R^4 can form a polycyclic ring;

R^2 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, - $S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl or together with R^1 can form a spiro compound, or together with R^3 or together with R^4 can form a polycyclic ring;

R^3 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, - $S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^2 or together with R^1 can form a polycyclic ring, or together with R^4 can form a spiro compound;

R^4 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, - $S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^3 can form a spiro compound, or together with R^2 or together with R^1 can form a polycyclic ring;

R^5 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, - $S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^6 can form an optionally substituted polycyclic ring;

R^6 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, - $S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^5 or together with R^7 can form an optionally substituted polycyclic ring;

R^7 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, - $S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl optionally substituted C_{3-8} cycloalkenyl, or together with R^6 or together with R^8 can form an optionally substituted polycyclic ring;

R^8 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^7 or together with R^9 can form an optionally substituted polycyclic ring;

R^9 is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, CN, $-NR^{27}R^{28}$, NO_2, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^8 can form an optionally substituted polycyclic ring;

R^{10} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^{11} can form an optionally substituted polycyclic ring;

R^{11} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^{10} or together with R^{12} can form an optionally substituted polycyclic ring;

R^{12} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^{11} or together with R^{13} can form an optionally substituted polycyclic ring;

R^{13} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^{14} or together with R^{12} can form an optionally substituted polycyclic ring;

R^{14} is H, optionally substituted C_{1-24} alkyl, halogen, $-C(O)R^{25}$, $-OR^{26}$, -CN, $-NR^{27}R^{28}$, $-NO_2$, $-CF_3$, $-S(O)_xR^{29}$, $-P(O)(OH)_2$, $-OP(O)(OH)_2$, $-SR^{31}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, optionally substituted C_{3-8} cycloalkenyl, or together with R^{13} can form a polycyclic ring;

R^{25} is -OH, $-OR^{30}$, $-NR^{27}R^{28}$, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{26} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{27} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{28} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{29} is H, optionally substituted C_{1-24} alkyl, $-OR^{26}$, $-NR^{27}R^{28}$, optionally substituted heterocycle, optionally substituted C_{3-10} cycloalkyl, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{30} is optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl, or optionally substituted C_{3-8} cycloalkenyl;

R^{31} is H, optionally substituted C_{1-24} alkyl, optionally substituted C_{3-10} cycloalkyl, optionally substituted heterocycle, optionally substituted C_{5-24} aryl or optionally substituted C_{3-8} cycloalkenyl; and

x is 1 or 2.

33. The coating composition of ~~claim 4 or~~ claim 32, wherein: L^2 is $PR^{H1}R^{H2}R^{H3}$ wherein: R^{H1}, R^{H2}, and R^{H3} are each independently optionally substituted C_6-C_{10} aryl, optionally substituted C_1-C_{10} alkyl, or optionally substituted C_3-C_{10} cycloalkyl.

34. The coating composition of ~~any of~~ claim~~s 4,~~ 32 or claim 33, wherein: R^1 is hydrogen and R^2 is phenyl; or R^1 is hydrogen and R^2 is 3-methyl-1-propenyl; or R^1 and R^2 are linked together to form 3-phenylindenylid-1-ene.

35. The coating composition of claim 34, wherein: R^{H1} is phenyl, ethyl, or cyclohexyl, R^{H2} is phenyl or cyclohexyl, and R^{H3} is phenyl, ethyl, or cyclohexyl.

36. The coating composition of any one of claims 1-11 and claims 32-35, wherein the composition further comprises an inorganic filler selected from mica, glass fibers, wollastonite, calcium carbonate, silica, and mixtures thereof.

37. The method of claim 26 or claim 27, wherein the inorganic filler is selected from aluminum powder or alloys thereof, aluminum flakes or alloys thereof, micaceous iron oxide, mica, glass fibers, wollastonite, calcium carbonate, silica, and mixtures thereof.

38. The method of claim 37, wherein the inorganic filler is selected from aluminum powder or alloys thereof, aluminum flakes or alloys thereof, micaceous iron oxide, and mixtures thereof.

39. The method of claim 38, wherein the inorganic filler is selected from aluminum powder or alloys thereof, aluminum flakes or alloys thereof, and mixtures thereof.