

CLAIMS

What is claimed is:

- 5 1. A composition comprising a mixture or solution of:
 acetylene; and
 a stabilizer comprising an amide having a vapor pressure of about 3 Torr or lower at
25° C, an amine, an imine, a nitrile having a vapor pressure of about 80 Torr or lower at 25°
C, a nitrogen-containing saturated heterocyclic ring compound, a nitrogen-containing
10 unsaturated heterocyclic ring compound, an unsaturated linear or branched hydrocarbon, an
unsaturated ring hydrocarbon having a vapor pressure of about 5 Torr or lower at 25° C, a non-
aromatic unsaturated ring hydrocarbon, an ether, a ketone, an aldehyde, an ester having a vapor
pressure of about 90 Torr or lower at 25° C, an ionic liquid, a carbene, a silylene, a mixed
electron donor compound comprising a pi bond and an atom having a lone electron pair, a
15 phosphorus-containing compound in which the phosphorus atom has a lone electron pair, or a
sulfur-containing compound in which the sulfur atom has a lone electron pair,
 wherein the ketone has a vapor pressure of about 30 Torr or lower at 25° C; or wherein
the ketone is selected from the group consisting of acetylacetone (acac), 2-butanone, 2-
pentanone, 2-hexanone, 2-heptanone, 2-octanone, 2-nonanone, 2-decanone, 3-pentanone, 3-
20 heptanone, 3-octanone, 3-nonanone, 3-decanone, and aromatic aldehydes such as
acetophenone, 3-hydroxyacetophenone, cyclohexanone, benzophenone, butyrophenone,
acetylpyrazine, 2-acetyl pyridine, acrylophenone, capillin, dibenzoylmethane, indenone, 1-
indanone, paroxypropione, phenylglyoxal, piceol, propiophenone, pyridoxal, 2,4,6-
trihydroxyacetophenone, 2,4,5-trihydroxyacetophenone, and valerophenone.
- 25 2. The composition of claim 1, wherein the stabilizer is the ionic liquid comprising
a cation selected from the group consisting of imidazolium, pyridinium, ammonium,
phosphonium, thiazolium, and triazolium.
- 30 3. The composition of claim 1, wherein the stabilizer is the carbene selected from
the group consisting of transition metal carbene complexes, *N*-heterocyclic carbenes, and
methylenes.

4. The composition of claim 1, wherein the stabilizer is the silylene or an *N*-heterocyclic silylene.

5. The composition of claim 1, wherein the stabilizer comprises the ketone having
5 a vapor pressure of about 30 Torr or lower at 25° C.

6. The composition of claim 1, wherein the stabilizer comprises the ketone selected from the group consisting of acetylacetone (acac), 2-butanone, 2-pentanone, 2-hexanone, 2-heptanone, 2-octanone, 2-nonanone, 2-decanone, 3-pentanone, 3-heptanone, 3-octanone, 3-nonanone, 3-decanone, and aromatic aldehydes such as acetophenone, 3-hydroxyacetophenone, cyclohexanone, benzophenone, butyrophenone, acetylpyrazine, 2-acetyl pyridine, acrylophenone, capillin, dibenzoylmethane, indenone, 1-indanone, paroxypropione, phenylglyoxal, piceol, propiophenone, pyridoxal, 2,4,6-trihydroxyacetophenone, 2,4,5-trihydroxyacetophenone, and valerophenone.

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7. The composition of claim 1, wherein the stabilizer comprises the aldehyde.

8. The composition of claim 7, wherein the stabilizer is benzaldehyde.

9. The composition of claim 1, wherein the stabilizer comprises the ester having a
20 vapor pressure of about 90 Torr or lower at 25° C.

10. The composition of claim 1, wherein the stabilizer comprises the amide having a vapor pressure of about 3 Torr or lower at 25° C.

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11. The composition of claim 1, wherein the stabilizer comprises the ether.

12. The composition of claim 11, wherein the stabilizer is selected from the group consisting of furan, tetrahydrofuran, and pyran.

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13. The composition of claim 1, wherein the stabilizer comprises the amine.

14. The composition of claim 13, wherein the amine is selected from the group consisting of *N*-ethyldiisopropylamine, trimethylamine, dimethylamine, methylamine, triethylamine, and tert-butylamine.

5 15. The composition of claim 13, wherein the amine is an aromatic amine.

16. The composition of claim 15, wherein the aromatic amine is selected from the group consisting of aniline, *N,N*-dimethylaniline, piperidine, pyrrole, pyrrolidine, pyridine, piperidine, imidazole, and pyrimidine.

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17. The composition of claim 1, wherein the stabilizer comprises the imine.

18. The composition of claim 17, wherein the imine is selected from the group consisting of Schiff bases and 2,5-cyclohexadiene-1,4-diimine.

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19. The composition of claim 1, wherein the stabilizer comprises the nitrile having a vapor pressure of about 80 Torr or lower at 25° C.

20. The composition of claim 1, wherein the stabilizer comprises the nitrogen-containing saturated heterocyclic ring compound.

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21. The composition of claim 20, wherein the nitrogen-containing saturated heterocyclic ring compound is selected from the group consisting of pyrrolidine and morpholine.

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22. The composition of claim 1, wherein the stabilizer comprises the nitrogen-containing unsaturated heterocyclic ring compound.

23. The composition of claim 22, wherein the nitrogen-containing unsaturated heterocyclic ring compound is selected from the group consisting of pyridine, pyrazine, imidazole, pyrrole, *N*-iminopyridinium ylide, triazole, thiazole, and substituted derivatives of any of these such as *N*-methylimidazole, 2,6-lutidine, and 4-*N,N*-dimethylaminopyridine.

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24. The composition of claim 1, wherein the stabilizer comprises the mixed electron donor compound comprising a pi bond and an atom having a lone electron pair.

25. The composition of claim 24, wherein the mixed electron donor compound is
5 selected from the group consisting of acetone, imine, 2-methyl-2-butenone, triazole, and thiazole.

26. The composition of claim 1, wherein the stabilizer comprises the phosphorus-
10 containing compound in which the phosphorus atom has a lone electron pair.

27. The composition of claim 26, wherein the phosphorus-containing compound is selected from the group consisting of triphenylphosphine and triphenylphosphine oxide.

28. The composition of claim 1, wherein the stabilizer comprises the sulfur-
15 containing compound in which the sulfur atom has a lone electron pair.

29. The composition of claim 28, wherein the sulfur-containing compound is selected from the group consisting of thiophene, thiazolium, thiazole, 2-methylthiophene, 3-methylthiophene, 2,4-dimethylthiophene, benzothiophene, and 2-methylbenzothiophene.
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30. The composition of claim 1, wherein the stabilizer comprises the unsaturated linear or branched hydrocarbon.

31. The composition of claim 30, wherein the unsaturated linear or branched
25 hydrocarbon is selected from the group consisting of butene, butadiene, 1-butyne, propyne, pentene, octene, heptene, hexyne, 1-heptyne, 1-octyne, 1-nonyne, and 1-decyne.

32. The composition of claim 1, wherein the stabilizer comprises the unsaturated ring hydrocarbon having a vapor pressure of about 5 Torr or lower at 25° C.
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33. The composition of claim 1, wherein the stabilizer comprises the non-aromatic unsaturated ring hydrocarbon.

34. The composition of claim 33, wherein the stabilizer is cyclopentene or cyclohexene.

35. The composition of any one of claims 1-34, wherein the acetylene and the
5 stabilizer are stored in a containment vessel.

36. The composition of any one of claims 1-35, wherein the acetylene and stabilizer are stored under a pressure of at least about 200 psi.

10 37. A stabilized composition comprising:

a pressurized acetylene; and

a stabilizer is a stabilizer comprising a nitrogen atom, wherein the stabilizer is not dimethylformamide, not dimethylacetamide, not *N*-methyl-2-pyrrolidone, and not acetonitrile; a heterocycle, wherein the stabilizer is not 1,3-dioxolane, not 1,4-dioxane, and not *N*-methyl-
15 2-pyrrolidone; a substituted aromatic hydrocarbon having one or more substitutions, wherein the one or more substitutions are selected from the group consisting of halo, amine, and optionally substituted C₂₋₈ alkyl; an optionally substituted alkene or an optionally substituted alkyne; an aldehyde or an ether, wherein the stabilizer is not 1,3-dioxolane and not 1,4-dioxane; an ester selected from the group consisting of a cyclic ester, a glycol based ester, a lactate, a
20 carbonate ester, an amino ester, and a diester; a cyclic ketone, an aryl ketone, a dione, or a trione; a carbene or a carbene derivative; a metal compound, an onium compound, an organosulfur compound, or an organophosphorus compound, wherein the stabilizer is not dimethylsulfoxide; or an ionic liquid.

25 38. The stabilized composition of claim 37, wherein the stabilizer is the stabilizer comprising the nitrogen atom and further comprises optionally substituted heterocycl.

39. The stabilized composition of claim 37, wherein the stabilizer is the stabilizer comprising the nitrogen atom and is an amide, an amine, a guanidine, an imine, or an N-
30 heterocyclic carbene.

40. The stabilized composition of claim 37, wherein the stabilizer is the stabilizer comprising the nitrogen atom and is an amide selected from the group consisting of a dialkyl amide, a pyrrolidone, an acetamide, a morpholide, an ester amide, and a cyclic amide.

5 41. The stabilized composition of claim 37, wherein the stabilizer is the stabilizer comprising the nitrogen atom and is an amine comprising optionally substituted aliphatic, optionally substituted alkyl, optionally substituted aryl, optionally substituted aliphatic-aryl, optionally substituted alkyl-aryl, optionally substituted alkenyl-aryl, optionally substituted alkynyl-aryl, optionally substituted heteroaliphatic, optionally substituted heteroalkyl,
10 optionally substituted heterocyclyl, or optionally substituted alkyl-heterocyclyl.

42. The stabilized composition of claim 37, wherein the stabilizer is the stabilizer comprising the nitrogen atom and is a Schiff base.

15 43. The stabilized composition of claim 37, wherein the stabilizer is the heterocycle, and wherein the stabilizer is not 1,3-dioxolane, not 1,4-dioxane, and not *N*-methyl-2-pyrrolidone.

44. The stabilized composition of claim 43, wherein the heterocycle is an aromatic
20 heterocycle, a bicyclic heterocycle, a cyclic ether, a cyclic ester, a cyclic carbonate ester, a cyclic amine, a cyclic amide, or an N-heterocyclic carbene.

45. The stabilized composition of claim 43, wherein the heterocycle comprises one or more heteroatoms selected from the group consisting of N, O, or S.

25 46. The stabilized composition of claim 37, wherein the stabilizer is the substituted aromatic hydrocarbon having one or more substitutions, and wherein the one or more substitutions are selected from the group consisting of halo, amine, and optionally substituted C₂₋₈ alkyl.

30 47. The stabilized composition of claim 46, wherein the aromatic hydrocarbon comprises a first substitution selected from the group consisting of halo, amine, and optionally

substituted C₂₋₈ alkyl and a second substitution selected from the group consisting of halo, amine, and optionally substituted alkyl.

48. The stabilized composition of claim 37, wherein the stabilizer is the optionally substituted alkene or the optionally substituted alkyne.

49. The stabilized composition of claim 48, wherein the optionally substituted alkene is a diene.

50. The stabilized composition of claim 37, wherein stabilizer is the aldehyde or the ether, and wherein the stabilizer is not 1,3-dioxolane and not 1,4-dioxane.

51. The stabilized composition of claim 50, wherein the aldehyde comprises an optionally substituted aliphatic, optionally substituted alkyl, optionally substituted aryl, optionally substituted aliphatic-aryl, optionally substituted alkyl-aryl, optionally substituted alkenyl-aryl, optionally substituted alkynyl-aryl, optionally substituted heteroaliphatic, optionally substituted heteroalkyl, optionally substituted heterocyclyl, or optionally substituted alkyl-heterocyclyl having one or more aldehyde moieties.

52. The stabilized composition of claim 50, wherein the ether comprises optionally substituted aliphatic, optionally substituted alkyl, optionally substituted aryl, optionally substituted aliphatic-aryl, optionally substituted alkyl-aryl, optionally substituted alkenyl-aryl, optionally substituted alkynyl-aryl, optionally substituted heteroaliphatic, optionally substituted heteroalkyl, optionally substituted heterocyclyl, or optionally substituted alkyl-heterocyclyl.

53. The stabilized composition of claim 37, wherein the stabilizer is the ester selected from the group consisting of a cyclic ester, a glycol based ester, a lactate, a carbonate ester, an amino ester, and a diester.

54. The stabilized composition of claim 53, wherein the ester comprises one or more amino.

55. The stabilized composition of claim 37, wherein the stabilizer is the cyclic ketone, the aryl ketone, the dione, or the trione.

56. The stabilized composition of claim 55, wherein the stabilizer comprises
5 optionally substituted cycloalkyl or optionally substituted aryl.

57. The stabilized composition of claim 37, wherein the stabilizer is the carbene or the carbene derivative.

10 58. The stabilized composition of claim 57, wherein the carbene comprises optionally substituted aliphatic, optionally substituted alkyl, optionally substituted aryl, optionally substituted aliphatic-aryl, optionally substituted alkyl-aryl, optionally substituted alkenyl-aryl, optionally substituted alkynyl-aryl, or optionally substituted heterocyclyl; or .

15 59. The stabilized composition of claim 57, wherein the carbene or the carbene derivative comprises a thiazol-2-ylidene moiety, a dihydroimidazol-2-ylidene moiety, an imidazol-2-ylidene moiety, a phosphinocarbene moiety, a triazol-5-ylidene moiety, or a cyclopropenylidene moiety.

20 60. The stabilized composition of claim 57, wherein the carbene or the carbene derivative is selected from the group consisting of an aminothiocarbene compound, an aminooxycarbene compound, a diaminocarbene compound, a heteroamino carbene compound, a 1,3-dithiolium carbene compound, a mesoionic carbene compound, a cyclic alkyl amino carbene compound, a boranylidene compound, a silylene compound, a stannylene compound,
25 a nitrene compound, a phosphinidene compound, and a foiled carbene compound.

61. The stabilized composition of claim 37, wherein the stabilizer is the metal compound, the onium compound, the organosulfur compound, or the organophosphorus compound, wherein the stabilizer is not dimethylsulfoxide.

30 62. The stabilized composition of claim 61, wherein the onium compound is selected from the group consisting of a nitronium ion, a nitrosonium ion, a

bis(triphenylphosphine) iminium ion, an iminium ion, a diazenium ion, a guanidinium ion, a nitrilium ion, a diazonium ion, a pyridinium ion, a pyrylium ion, and a thionitrosyl ion.

63. The stabilized composition of claim 61, wherein the organosulfur compound is
5 selected from the group consisting of a thioester, a sulfoxide, a sulfone, a thiosulfinate, a sulfimide, a sulfoximide, a sulfonediimine, an S-nitrosothiol, a thioketone, a thioaldehyde, a thioamide, a sulfonium, an oxosulfonium, and a thiocarbonyl ylide.

64. The stabilized composition of claim 61, wherein the organophosphorus
10 compound is selected from the group consisting of a phosphate ester, a phosphate amide, a phosphonate, a phosphinate, a phosphine oxide, a phosphine imide, and a phosphonium salt.

65. The stabilized composition of claim 37, wherein the stabilizer is the ionic liquid.

15 66. The stabilized composition of claim 65, wherein the ionic liquid comprises a cationic moiety comprising imidazolium, pyridinium, pyrrolidinium, ammonium, phosphonium, thiazolium, or triazolium; and further comprises an anionic moiety comprising tetrafluoroborate, hexafluorophosphate, bistriflimide, triflate, acetate, trifluoroacetate, triflimide, halide, bis(trifluoromethylsulfonyl)imide, methylsulfate, ethyl sulfate, docusate, or
20 dicyanamide.