

What is claimed is:

1. A catalytically active substance, comprising:
a copper (I) sulfide mineral particle; and
an alkyne functionalized molecule bound directly to a surface of the copper (I) sulfide
5 mineral particle.
2. The catalytically active substance as defined in claim 1, wherein the copper (I) sulfide mineral particle is selected from the group consisting of chalcocite, djurleite, and digenite.
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3. The catalytically active substance as defined in claim 1 or 2, wherein the alkyne functionalized molecule is a primer having an alkyne functional group attached at the 5' terminus of the primer.
- 15 4. The catalytically active substance as defined in any of claims 1 through 3, wherein a coordinate bond binds the alkyne functionalized molecule to the surface of the copper (I) sulfide mineral particle.
5. A method of making a triazole, comprising reacting an alkyne functionalized
20 molecule with an azide functionalized molecule in the presence of a copper (I) sulfide mineral.
6. The method as defined in claim 5, wherein:
the copper (I) sulfide mineral reacts with the alkyne functionalized molecule to form a catalytically active substance; and
25 the catalytically active substance reacts with the azide functionalized molecule to couple the catalytically active substance with the azide functionalized molecule.
7. The method as defined in claim 5 or 6, wherein prior to reacting the copper (I) sulfide mineral with the alkyne functionalized molecule, the method further comprises adding a stoichiometric excess of the copper (I) sulfide mineral, with respect to the alkyne functionalized molecule, to the alkyne functionalized molecule.
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8. The method as defined in claim 5 or 6, wherein the reacting of the copper (I) sulfide mineral with the alkyne functionalized molecule involves:

forming a mixture of the copper (I) sulfide mineral, the alkyne functionalized molecule, and a solvent of the alkyne functionalized molecule; and

5 maintaining the mixture at a temperature that is above a freezing point of the solvent and below a boiling point of the solvent for a time up to about 50 days.

9. The method as defined in claim 8, wherein:

the solvent is selected from the group consisting of water, a sodium carbonate buffer, a
10 potassium phosphate buffer, and dimethyl sulfoxide; and

a pH of the mixture ranges from about 4 to about 12.

10. The method as defined in claim 8 or 9, wherein the maintaining involves heating the mixture to a temperature ranging from about 30°C to about 60°C for a time ranging from
15 about 30 minutes to about 90 minutes.

11. The method as defined in claim 5 or 6, wherein prior to reacting the alkyne functionalized molecule or the catalytically active substance with the azide functionalized molecule, the method further comprises forming a layer of the azide functionalized molecule on
20 a surface of a flow cell substrate, and wherein the alkyne functionalized molecule or the catalytically active substance is reacted with the layer of the azide functionalized molecule on the surface of the flow cell substrate.

12. The method as defined in claim 11, wherein the alkyne functionalized molecule or
25 the catalytically active substance is present in a liquid mixture, and wherein the liquid mixture is flowed over the layer of the azide functionalized molecule on the surface of the flow cell substrate.

13. The method as defined in claim 11 or 12, wherein prior to forming the layer, the
30 method further comprises attaching a silane or a silane derivative to the surface of the substrate to form a silanized surface.

14. The method as defined in any of claims 6 through 13, further comprising filtering unreacted copper (I) sulfide mineral from the catalytically active substance prior to reacting the catalytically active substance with the azide functionalized molecule.

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15. The method as defined in any of claims 5 through 14, wherein the copper (I) sulfide has an average particle size ranging from about 500 nm to about 45 μ m.

16. The method as defined in any of claims 5 through 15, wherein the method is performed without ligand coordination and without exposure to a reducing agent.

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17. A graft mix, comprising:
a primer including an alkyne functional group;
a solvent; and
a copper (I) sulfide mineral.

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18. The graft mix as defined in claim 17, wherein the alkyne functional group is to react with a surface of the copper (I) sulfide mineral to form a catalytically active substance in the graft mix.

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19. The graft mix as defined in claim 17, further comprising an azide functionalized molecule, wherein the azide functionalized molecule is to react with the alkyne functional group, mediated by the copper (I) sulfide mineral.

20. The graft mix as defined in claim 19, wherein the azide functionalized molecule is a polymer.

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21. The graft mix as defined in claim 20, wherein the polymer is on a surface of a substrate, optionally wherein the substrate is a flow cell.

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22. The graft mix as defined in any of claims 17 through 21, wherein the graft mix includes a stoichiometric excess of the copper (I) sulfide mineral with respect to the primer.

23. The graft mix as defined in any of claims 17 through 22, wherein the graft mix
5 includes:

from about 1 μ M to about 20 μ M of the primer; and
from about 0.1 M to about 3 M of the copper (I) sulfide mineral.

24. The graft mix as defined in any of claims 17 through 21, wherein the copper (I)
10 sulfide mineral is selected from the group consisting of chalcocite, djurleite, and digenite, and has an average particle size ranging from about 500 nm to about 45 μ m.

25. A method of grafting a primer to a flow cell surface, comprising:
reacting an alkyne functionalized primer in the presence of a copper (I) sulfide mineral
15 with an azide functionalized molecule on the flow cell surface.

26. The method as defined in claim 25, wherein:
the copper (I) sulfide mineral reacts with the alkyne functionalized primer to form a
catalytically active substance; and
20 the catalytically active substance reacts with the azide functionalized molecule to
couple the catalytically active substance with the azide functionalized molecule on the flow cell
surface.

27. The method as defined in claim 26, wherein prior to reacting the copper (I) sulfide
25 mineral with the alkyne functionalized primer, the method further comprises adding a
stoichiometric excess of the copper (I) sulfide mineral, with respect to the alkyne functionalized
primer, to the alkyne functionalized primer.

28. The method as defined in claim 26, wherein the reacting of the copper (I) sulfide
30 mineral with the alkyne functionalized primer involves:

forming a mixture of the copper (I) sulfide mineral, the alkyne functionalized primer, and a solvent of the alkyne functionalized primer; and

maintaining the mixture at a temperature that is above a freezing point of the solvent and below a boiling point of the solvent for a time up to about 50 days.

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29. The method as defined in claim 28, wherein:

the solvent is selected from the group consisting of water, a sodium carbonate buffer, a potassium phosphate buffer, and dimethyl sulfoxide; and

a pH of the mixture ranges from about 4 to about 12.

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30. The method as defined in claim 28 or 29, wherein the maintaining involves heating the mixture to a temperature ranging from about 30°C to about 60°C for a time ranging from about 30 minutes to about 90 minutes.

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31. The method as defined in claim 26, wherein prior to reacting the catalytically active substance with the azide functionalized molecule on the flow cell surface, the method further comprises forming a layer of the azide functionalized molecule on the flow cell surface, and wherein the catalytically active substance is reacted with the layer of the azide functionalized molecule on the flow cell surface.

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32. The method as defined in claim 31, wherein the catalytically active substance is present in a liquid mixture, and wherein the liquid mixture is flowed over the layer of the azide functionalized molecule on the flow cell surface.

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33. The method as defined in claim 31 or 32, wherein prior to forming the layer, the method further comprises attaching a silane or a silane derivative to the flow cell surface to form a silanized surface.

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34. The method as defined in any of claims 31 through 33, wherein the layer of the azide functionalized molecule is poly(N-(5-azidoacetamidylpentyl) acrylamide-co-acrylamide).

35. The method as defined in any of claims 26 through 34, further comprising filtering unreacted copper (I) sulfide mineral from the catalytically active substance prior to reacting the catalytically active substance with the azide functionalized molecule on the flow cell surface.