CLAIMS

1. A method for neutralizing metal atoms, the method comprising the steps of:

reacting a composition having an active ingredient having at least one nucleophilic carbonyl moiety and at least one nucleophilic oxime nitrogen moiety with a metal; and

chelating the metal to form a ring structure in which the at least one nucleophilic carbonyl moiety and at least one nucleophilic oxime nitrogen moiety are bonded to the metal; and

wherein the metal is selected from the group consisting of lead, radioactive metals, Pu, Th, U, Zr, Nb, Ru, actinides, lanthanides, rare earth metals, and combination thereof, and

wherein the composition is used to decontaminate a surface after exposure to the metal atoms.

2. The method of claim 1, wherein the active ingredient comprises 2,3, butanedione monoxime or an alkali or alkaline salt thereof.

3. The method of claim 1, wherein the active ingredient comprises potassium 2,3, butanedione monoxime.

4. The method of any one of claims 1 to 3, wherein the ring has 5 to 7 sides.

5. The method of any one of claims 1 to 4, wherein the composition containing the active ingredient is applied in an amount ranging from about 1:1 to 20:1 based on the amount of metal.

6. The method of claim 1, wherein the active ingredient is selected from the group consisting of 2,3 pentandione monoxime, 3,4 pentandione monoxime, 3,4 hexanone monoxime, 2,3 hexananone monoxime and 4,5 hexanone monoxime (alternate names may include 2,3-pentanedione 3-oxime (CAS 609-29-0) 2 oximo pentane-3-one, 3, oximo pentane -4-one, 2,3-Pentanedione, 3-oxime, 2,4-Pentanedione oxime, Pentane-2,3-dione 2-oxime, 2,3,4-Pentanetrione, 3-oxime, 2,4-Pentanedione, dioxime, and 2,4-Pentanedione, 2,4-dioxime, and combinations thereof.

7. The method of any one of claims 1 to 5, wherein the active ingredient comprises 2,3, butanedione monoxime, and further comprising the step of:

reacting the metal with a first and second molecule of 2,3,butanedione monoxime to form a chelated metal having a square planar complex.

8. The method of any one of claims 1 to 7, further comprising the step of removing any residual from the surface.

9. The method of any one of claims 1 to 8, wherein the composition is applied to a metal, stone or plastic surface.

10. A method for neutralizing metal atoms, the method comprising the steps of:

reacting a composition comprising 2,3,butanedione monoxime or an alkali salt thereof with a metal; and

chelating the metal to form a ring structure in which the carbonyl moiety and the at least one nucleophilic oxime nitrogen moiety of the 2,3,butanedione monoxime or an alkali salt thereof are bonded to the metal;

wherein the composition is used as a topical skin protectant to be applied to human skin prior to or after exposure to the metal atoms.

11. The method of claim 10, wherein the composition is applied to the skin of a person in need thereof.

12. The method of claim 10 or claim 11, wherein the active ingredient comprises potassium 2,3, butanedionemonoxime.

13. The method of any one of claims 10 to 12, wherein the ring has 5 to 7 sides.

14. The method of any one of claims 10 to13, wherein the composition containing the active ingredient is applied in an amount ranging from about 1:1 to 20:1 based on the amount of metal.

15. The method of claim 10, further comprising the step of:

reacting the metal with a first and second molecule of 2,3,butanedionemonoxime to form a chelated metal having a square planar complex.

16. The method of any one of claims 10 to 15, wherein the composition further comprises a carrier in which 2,3,butanedione monoxime or an alkali salt thereof is dispersed.

17. The method of claim 16, wherein the carrier is selected from the group consisting of polyethylene glycol (PEG), monomethoxypolyethylene glycol (mPEG) and combinations thereof.

18. The method of claim 17, wherein the carrier is mPEG.

19. The method of any one of claims 10 to 18, wherein the composition is a cream, a gel, or a lotion.

20. The method of any one of claims 10 to 19, further comprising removing any residual from the human skin.

21. The method of any one of claims 10 to 20, wherein the metal is selected from the group consisting of lead, radioactive metals, Pu, Th, U, Zr, Nb, Ru, actinides, lanthanides, rare earth metals, and combination thereof.

CLAIMS

1. A method for neutralizing metal atoms, the method comprising the steps of:

reacting a composition having an active ingredient having at least one nucleophilic carbonyl moiety and at least one nucleophilic oxime nitrogen moiety with a metal; and

chelating the metal to form a ring structure in which the at least one nucleophilic carbonyl moiety and at least one nucleophilic oxime nitrogen moiety are bonded to the metal; and

wherein the metal is selected from the group consisting of lead, radioactive metals, Pu, Th, U, Zr, Nb, Ru, actinides, lanthanides, rare earth metals, and combination thereof,

and the composition is used to decontaminate a surface after exposure to the metal atoms, wherein the surface is not human or animal skin.

2. The method of claim 1, wherein the active ingredient comprises 2,3-butanedione monoxime or an alkali or alkaline earth salt thereof.

3. The method of claim 1, wherein the active ingredient comprises potassium 2,3-butanedione monoxime.

4. The method of any one of claims 1 to 3, wherein the ring has 5 to 7 sides.

5. The method of any one of claims 1 to 4, wherein the composition containing the active ingredient is applied in an amount ranging from about 1:1 to 20:1 based on the amount of metal.

6. The method of claim 1, wherein the active ingredient is selected from the group consisting of 2,3-pentandione monoxime, 3,4-pentandione monoxime, 3,4-hexanone monoxime, 2,3-hexananone monoxime, 4,5-hexanone monoxime, 2,3- pentanedione 3-oxime, 2 oximo pentane-3-one, 3, oximo pentane -4-one, 2,3-Pentanedione, 3-oxime, 2,4-Pentanedione oxime, Pentane-2,3-dione 2-oxime, 2,3,4-Pentanetrione, 3-oxime, 2,4-Pentanedione, dioxime, and 2,4-Pentanedione, 2,4-dioxime, and combinations thereof.

7. The method of any one of claims 1 to 5, wherein the active ingredient comprises 2,3-butanedione monoxime, and further comprising the steps of:

reacting the metal with a first and second molecule of 2,3-butanedione monoxime to form a chelated metal having a square planar complex.

8. The method of any one of claims 1 to 7, further comprising the step of removing any residual from the surface.

9. The method of any one of claims 1 to 8, wherein the composition is applied to a metal, stone or plastic surface.

10. A method for neutralizing metal atoms, the method comprising the steps of:

reacting a composition comprising 2,3-butanedione monoxime or an alkali or alkaline earth salt thereof with a metal; and

chelating the metal to form a ring structure in which the carbonyl moiety and the at least one nucleophilic oxime moiety of the 2,3-butanedione monoxime or an alkali salt thereof are bonded to the metal;

wherein the composition is used to decontaminate a surface after exposure to the metal atoms, wherein the surface is not a human or animal skin.

11. The method of claim 10, wherein the active ingredient comprises potassium 2,3-butanedione monoxime.

12. The method of any one of claims 10 to 11, wherein the ring has 5 to 7 sides.

13. The method of any one of claims 10 to 12, wherein the composition containing the active ingredient is applied in an amount ranging from about 1:1 to 20:1 based on the amount of metal.

14. The method of claim 13, further comprising the steps of:

reacting the metal with a first and second molecule of 2,3-butanedione monoxime to form a chelated metal having a square planar complex.

15. The method of any one of claims 10 to 14, wherein the composition further comprises a carrier in which the active ingredient is dispersed.

16. The method of claim 15, wherein the carrier is selected from the group consisting of polyethylene glycol (PEG), monomethoxypolyethylene glycol (mPEG) and combinations thereof.

17 The method of claim 16, wherein the carrier is mPEG.

18. The method of any one of claims 10 to 17, wherein the composition is a cream, a gel, or a lotion.

19. The method of any one of claims 10 to 18, further comprising removing any residual from the surface.

20. The method of any one of claims 10 to 19, wherein the metal is selected from the group consisting of lead, radioactive metals, Pu, Th, U, Zr, Nb, Ru, actinides, lanthanides, rare earth metals, and combination thereof.

21. A composition for neutralizing metal atoms on human skin or on a surface, comprising an active ingredient comprising 2,3-butanedione monoxime, or an alkali or alkaline earth salt thereof,

wherein the composition neutralizes metal atoms by the steps of:

reacting the composition with a metal atom; and

chelating the metal atom to form a ring structure in which the carbonyl moiety and the at least one oxime nitrogen moiety of the 2,3-butanedione monoxime are bonded to the metal atom;

wherein the composition is: 1) applied as a topical skin protectant to the skin prior to or after exposure to the metal atoms, or 2) applied to decontaminate a surface exposed to the metal atoms,

such that the metal atoms become chelated and said skin or surface is decontaminated.

22. The composition of claim 20, wherein the active ingredient comprises potassium 2,3-butanedione monoxime.

23. The composition of claim 21 or 22, wherein the metal atom is selected from the group consisting of heavy metals, transition metals, lead, radioactive metals, Pu, Th, U, Zr, Nb, Ru, actinides, lanthanides, rare earth metals, and a combination thereof.

24. The composition of any one of claims 21 to 23, wherein the ring structure formed has 5 to 7 sides.

25. The composition of any one claims 21 to 24, wherein the composition containing the active ingredient is applied in a weight amount ratio ranging from 1:1 to 20:1 based on the weight of the metal atoms.

26. The composition of any one of claims 21 to 25, wherein the metal atom is selected from the group consisting of heavy metals and combinations thereof.

27. The composition of any one of claims 21 to 25, wherein the metal atom is selected from the group consisting of transition metals and combinations thereof.

28. The composition of any one of claims 21 to 25, wherein the metal atom is selected from the group consisting of radioactive metals and combinations thereof.

29. The composition of any one of claims 21 to 25, wherein the metal atom is selected from the group consisting of actinides, lanthanides and combinations thereof.

30. The composition of any one of claims 21 to 25, wherein the metal atom is selected from the group consisting of rare earth metals and combinations thereof.

31. The composition of any one of claims 21 to 25, wherein the metal atom is selected from the group consisting of lead, Pu, Th, U, Zr, Nb, Ru, and combinations thereof.

32. The composition of any one of claims 21 to 31, wherein the composition further comprises a carrier in which the 2,3-butanedione monoxime or an alkali salt thereof is dispersed.

32. The composition of claim 32, wherein the carrier is selected from the group consisting of polyethylene glycol, monomethoxy-polyethylene glycol, and polyethylene glycol ether.

33. The composition of claim 32, wherein the carrier is monomethoxy-polyethylene glycol.

34. The composition of any one of claims 21 to 33, wherein the composition is a cream, a gel, or a lotion.

35. A method for neutralizing radionuclides on a surface, the method comprising the steps of:

reacting a composition comprising 2,3-butanedione monoxime, or an alkali or alkaline earth salt thereof with a radionuclide; and

chelating the radionuclide to form a ring structure in which the carbonyl moiety and the at least one nucleophilic oxime nitrogen moiety of the 2,3-butanedione monoxime are bonded to the radionuclide,

wherein the composition is used to decontaminate a surface after exposure to the radionuclide, wherein the surface is not a human or animal skin.

36. A composition for neutralizing radionuclides on a surface, comprising an active ingredient comprising 2,3-butanedione monoxime, or an alkali or alkaline earth salt thereof,

wherein the composition neutralizes radionuclides by the steps of:

reacting the composition with a radionuclide; and

chelating the radionuclide to form a ring structure in which the carbonyl moiety and the at least one oxime nitrogen moiety of the 2,3-butanedione monoxime are bonded to the radionuclide;

wherein the composition is: 1) applied as a topical skin protectant to the skin prior to or after exposure to the radionuclides, or 2) applied to decontaminate a surface exposed to the radionuclides,

such that the radionuclides become chelated and said skin or surface is decontaminated.