What is claimed is:

1. A reactive coating system comprising:

(A) an activating liquid comprising

(1) a polymer emulsion comprising polyacrylate latex polymer solids or the powdered polymer derived therefrom;

(2) an alkali silicate;

(3) solvent; and

(B) a reactive solid mixture comprising

(1) an aluminosilicate.

2. The reactive coating system of claim 1, wherein the reactive solid mixture further comprises (2) an amphoteric metal oxide.

3. The reactive coating composition of claim 2, wherein the amphoteric metal oxide is a metal oxide containing a group 3 or 4 transition metal species or a group 13 element or mixtures thereof.

4. The reactive coating composition of claim 3, wherein the amphoteric metal oxide is selected from boron oxide, aluminum oxide, zirconium oxide, scandium oxide, yttrium oxide, zinc oxide, hafnium oxide or mixtures thereof.

5. The reactive coating composition of claim 2, wherein the amphoteric metal oxide comprises or consists of zirconium oxide.

6. The reactive coating composition of claim 2, wherein the amphoteric metal oxide comprises or consists of yttria stabilized zirconium oxide.

7. The reactive coating system of any of claims 1 to 6, wherein the alkali silicate is represented by the formula $M_{2n}SiO_{2+n}$.

8. The reactive coating system of claim 7, wherein M represents sodium, lithium, or potassium, or mixtures thereof.

9. The reactive coating system of claim 7 or 8, wherein n is 0.33 to 1.33 or 0.63 to 1.25.

10. The reactive coating system of claims 1 to 9, wherein the alkali silicate comprises or consists of sodium metasilicate.

11. The reactive coating system of any of claims 1 to 9, wherein the alkali silicate comprises the reaction product of (a) an alkali metal oxide, an alkali metal hydroxide, an alkali metal carbonate, an alkali metal bicarbonate, or mixtures thereof with (b) colloidal silica.

12. The reactive coating system of any of claims 1 to 11, wherein the polyacrylate latex polymer solids or the powdered polymer derived therefrom have a glass transition temperature of less than 150°C, or less than 100°C, or less than 75°C, or less than 40°C, or less than 30°C.

13. The reactive coating system of any of claims 1 to 13, wherein the polyacrylate latex polymer solids or the powdered polymer derived therefrom have a glass transition temperature of at least -40°C, or at least -20°C, or at least -10°C, or at least -5°C.

14. The reactive coating system of any of claims 1 to 13, wherein the solvent comprises water.

15. The reactive coating system of claim 14, wherein the solvent further comprises one or more co-solvents miscible with water selected from C1-6 aliphatic alcohols, C2-6 alkylene glycols, alcohol ethers, glycol ethers, glycol esters, and polyglycols having a MW less than 600

16. The reactive coating system of any of claims 1 to 15, further comprising one or more additives selected from humectants, surfactants, rheology modifiers/thickeners, antifoams, defoamers, preservatives, biocides, levelling agents, organic pigments, inorganic pigments, fillers, flame retardants, and mixtures thereof.

17. The reactive coating system of any of claims 1 to 165, wherein the aluminosilicate ~~comprises~~ is derived from calcined clay, incineration ash, natural pozzolans, volcanic ash, ground granulated blast furnace slag, industrial ground slag, mine tailings or wastes, zeolite, feldspars, framework aluminosilicates, synthetic glassy precursors (silicates, aluminates, aluminosilicates) and mixtures thereof.

18. The reactive coating composition of any of claims 1 to 16, wherein the aluminosilicate comprises or consists of metakaolin.

19. The reactive coating system of any of claims 2 to 18, wherein:

(A) 20% to 90%, or 60% to 85%, or 70% to 80% by weight of the activating liquid, wherein the activating liquid comprises

(1) 0.5 % to 35%, or 2% to 30%, or 5% to 25% by weight the latex polymer solids of a polyacrylate emulsion polymer or the powdered polymer derived therefrom;

(2) 5% to 49%, or 18% to 45%, or 30% to 40% by weight alkali silicate;

(3) 16% to 94.5 %, or 25% to 80%, or 35% to 65% by weight solvent; and

(4) 0% to 15%, or 0% to 10% by weight or one or more additives;

(B) 10% to 80%, or 5% to 40% or 20% to 30% by weight of the reactive solid mixture, wherein the reactive sold mixture comprises

(1) 70% to 99.5%, or 80% to 99%, or 85% to 99% by weight aluminosilicate; and

(2) 0.5% to 30%, or 1% to 20%, or 1% to 15% amphoteric metal oxide.

~~20. A reactive coating composition comprising:~~

~~(A) an activating liquid comprising~~

~~(1) a polyacrylate emulsion polymer or the powdered polymer derived therefrom; and~~

~~(2) an aqueous alkali silicate solution, wherein the aqueous alkali silicate solution comprises (a) a reactive alkali metal component, selected from an alkali metal oxide, an~~

alkali metal hydroxide, an alkali metal carbonate, an alkali metal bicarbonate, or mixtures thereof, (b) colloidal silica, and (c) water;

and

(B) a reactive solid mixture comprising

(1) an aluminosilicate.

21. The reactive coating composition of claim 19 wherein the reactive solid mixture further comprises (2) an amphoteric metal oxide.

22. The reactive coating composition of claim 21, wherein the amphoteric metal oxide is selected from boron oxide, aluminum oxide, zirconium oxide, scandium oxide, yttrium oxide, zinc oxide, hafnium oxide or mixtures thereof.

23. The reactive coating composition of claim 21, wherein the amphoteric metal oxide comprises or consists of zirconium oxide.

24. The reactive coating composition of claim 21, wherein the amphoteric metal oxide comprises or consists of yttria stabilized zirconium oxide.

25. The reactive coating system of any of claims 20 to 24, wherein the alkali silicate is represented by the formula $M_{2n}SiO_{2+n}$.

26. The reactive coating system of claim 25, wherein M represents sodium, lithium, or potassium, or mixtures thereof.

27. The reactive coating system of claim 25 or 26, wherein n is 0.33 to 1.33 or 0.63 to 1.25.

28. The reactive coating composition of any of claims 19 to 27 wherein the aqueous alkali silicate solution comprises or consists of (a) sodium hydroxide, (b) colloidal silica, and (c) water.

~~29. The reactive coating system of any of claims 19 to 28, wherein the colloidal silica comprises 5% to 60% or 45% to 60% by weight SiO_2 particles.~~

~~30. The reactive coating system of any of claims 20 to 29, wherein the polyacrylate emulsion polymer has a glass transition temperature of less than 150°C, or less than 100°C, or less than 75°C, or less than 40°C, or less than 30°C.~~

~~31. The reactive coating system of any of claims 1 to 13, wherein the polyacrylate emulsion polymer has a glass transition temperature of at least -40°C, or at least -20°C, or at least -10°C, or at least -5°C.~~

~~32. The reactive coating system of any of claims 20 to 31, wherein the activating liquid further comprises one or more additives selected from humectants, surfactants, rheology modifiers/thickeners, antifoams, defoamers, preservatives, biocides, levelling agents, organic pigments, inorganic pigments, fillers, flame retardants, and mixtures thereof.~~

~~33. The reactive coating system of any of claims 20 to 32, wherein the aluminosilicate is wherein the aluminosilicate is preferably metakaolin or another calcined clay but can also be selected from the following solid precursors, fly ash, incineration ash (including but not limited to rice husk, sugarcane leaves ash, palm oil, boiler ash, wastepaper sludge ash, municipal solid waste ash, bottom ash), natural pozzolans, volcanic ash, ground granulated blast furnace slag (from steel or iron), other industrial ground slag (including but not limited to phosphorous, ferronickel, ferrochrome magnesia-iron, copper, nickel, titaniferous), mine tailings or wastes (including but not limited to coal gangue, red mud), zeolite, feldspars, framework aluminosilicates, synthetic glassy precursors (silicates, aluminates, aluminosilicates) and mixtures thereof.~~

~~34. The reactive coating composition of any of claims 20 to 33, wherein the aluminosilicate comprises or consists of metakaolin.~~

~~35. The reactive coating composition of any of claims 20 to 34, wherein the coating composition comprises:~~

~~(A) 20% to 90%, or 60% to 85%, or 70% to 80% by weight of the activating liquid, wherein the activating liquid comprises~~

~~(1) 0.5 % to 35%, or 2% to 30%, or 5% to 25% by weight the latex polymer solids of a polyacrylate emulsion polymer or the powdered polymer derived therefrom;~~

~~(2) 5% to 49%, or 18% to 47%, or 30% to 45% by weight alkali silicate;~~

~~(3) 16% to 94.5 %, or 23% to 80%, or 30% to 55% by weight solvent; and~~

~~(4) 0% to 15%, or 0.5% to 10% by weight or one or more additives;~~

~~(B) 10% to 80%, or 15% to 40%, or 20% to 30% by weight of the reactive solid mixture, wherein the reactive sold mixture comprises~~

~~(1) 90% to 99.5%, or 93% to 99%, or 95% to 99% by weight aluminosilicate; and~~

~~(2) 0.5% to 10%, or 1% to 7%, or 1% to 5% amphoteric metal oxide.~~

~~36.~~ 20. A coating composition comprising:

(a) a geopolymer component, wherein the geopolymer component comprises the reaction product of an alkali metal silicate and an aluminosilicate;

(b) a polyacrylate polymer emulsion; and

(c) an amphoteric metal oxide.

~~37.~~ 21. The coating composition of claim ~~36~~ 20, wherein the alkali silicate is represented by the formula $M_{2n}SiO_{2+n}$.

~~38.~~ 22. The coating composition of claim ~~37~~ 21, wherein M represents sodium, lithium, or potassium, or mixtures thereof.

~~39.~~ 23. The coating composition of claim ~~36~~ 20 or ~~37~~ 21, wherein n is 0.33 to 1.33 or 0.63 to 1.25.

~~40.~~24. The coating composition of any of claims ~~36~~ 20 to ~~39~~ 23, wherein the geopolymer component has an Si/Al molar ratio of 1 to 4 or 1.5 to 3.

~~41.~~ 25. The coating composition of any of claims ~~36~~20 to ~~40~~ 24, wherein the alkali silicate comprises the reaction product of (a) an alkali metal oxide, an alkali metal hydroxide, an alkali metal carbonate, an alkali metal bicarbonate~~s~~, or mixtures thereof with (b) colloidal silica.

~~42.~~26. The coating composition of any of claims ~~36~~ 20 to ~~41~~ 25, wherein the polyacrylate polymer emulsion further comprises additives selected from surfactants, defoamers, latex stabilizers and combinations thereof.

~~43.~~27. The coating composition of any of claims ~~36~~ 20 to ~~42~~ 26, wherein the aluminosilicate is selected fly ash, incineration ash (including but not limited to rice husk, sugarcane leaves ash, palm oil, boiler ash, wastepaper sludge ash, municipal solid waste ash, bottom ash), natural pozzolans, volcanic ash, ground granulated blast furnace slag (from steel or iron), other industrial ground slag (including but not limited to phosphorous, ferronickel, ferrochrome magnesia-iron, copper, nickel, titaniferous), mine tailings or wastes (including but not limited to coal gangue, red mud), zeolite, feldspars, framework aluminosilicates, synthetic glassy precursors (silicates, aluminates, aluminosilicates) and mixtures thereof.

~~44.~~28. The coating composition of any of claims ~~36~~ 20 to ~~43~~ 27, wherein the aluminosilicate comprises or consists of metakaolin.

~~45.~~ 29. The coating composition of any of claims ~~36~~ 20 to ~~44~~ 28, wherein the amphoteric metal oxide is selected from boron oxide, aluminum oxide, zirconium oxide, scandium oxide, yttrium oxide, zinc oxide, hafnium oxide or mixtures thereof.

~~46.~~ 30. The coating composition of any of claim ~~45~~ 29, wherein the amphoteric metal oxide comprises or consists of zirconium oxide.

~~47.~~ 31. The coating composition of any of claims ~~36~~ 20 to ~~46~~ 30, wherein the alkali metal silicate is a sodium silicate.

~~48.~~32. The coating composition of any of claims ~~36~~ 20 to ~~47~~ 31, wherein the coating composition has an Si/Al ratio of 0.5 to 3.0 or 1.5 to 2.5.

~~49.~~ 33. The coating composition of any of claims ~~36~~ 20 to ~~48~~ 32, wherein the coating composition has an M/Al ratio of 0.5 to 2.5 or 1.0 to 2.0.