THE INVENTION CLAIMED IS:

1. A radiation polymerizable aqueous coating composition comprising:

(i) ethylenically unsaturated silane treated silica;

(ii) at least one water dispersible polyacrylate;

(iii) water dispersible ethylenically unsaturated oligomer; and

(iv) water.

2. The coating composition of claim 1 wherein the composition also comprises a water-miscible organic solvent.

3. The composition of claim 1 wherein the at least one water dispersible polyacrylate is an ethoxylated polyacrylate.

4. The composition of claim 1 wherein the at least one polyacrylate comprises a diacrylate.

5. The composition of claim 1 wherein the at least one polyacrylate comprises a polyacrylate having an average of more than two acrylate groups per molecule.

6. The composition of claim 1 wherein the at least one water dispersible polyacrylate comprises a diacrylate and a polyacrylate having an average of more than two acrylate groups per molecule.

7. The composition of claim 1 wherein the composition comprises, on a weight solids basis:

(i) 10-60% ethylenically unsaturated silane treated silica;

(ii) 10-60% at least one water dispersible polyacrylate; and

(iii) 5-60% water dispersible ethylenically unsaturated oligomer,

based upon the combined total weight solids of (i) and (ii) and (iii).

8. The composition of claim 7 wherein the composition comprises: on a weight solids basis:

(i) 10-35% ethylenically unsaturated silane treated silica;

(ii) 10-35% at least one water dispersible polyacrylate; and

(iii) 5-45% water dispersible ethylenically unsaturated oligomer,

based upon the combined total weight solids of (i) and (ii) and (iii).

9. The composition of claim 7 wherein the composition comprises:

(i) 10-50% ethylenically unsaturated silane treated silica;

(ii) 15-40% water dispersible diacrylate;

(iii) 5-25% water dispersible polyacrylate having an average of more than two acrylate groups per molecule; and

(iv) 5-60% water dispersible ethylenically unsaturated oligomer,

based upon the total weight solids of (i) and (ii) and (iii) and (iv).

10. The composition of claim 1 further characterized in that the composition also contains a catalytic amount of a polymerization catalyst.

11. The composition of claim 1 wherein the ethylenically unsaturated silane treated silica was obtained by a process which comprises:

(i) admixing an ethylenically unsaturated silane and a catalytic amount of acid with a silica organosol comprising silica dispersed in a water-miscible organic solvent; and

(ii) gradually adding an ethylenically unsaturated alkoxysilane to the admixture under reactive conditions; and

(iii) adding at least some of the water dispersible polyacrylate to the admixture while maintaining the admixture.

12. The coating composition of claim 1 wherein the water dispersible ethylenically unsaturated oligomer is an unsaturated hyberbranched polyester.

13. The coating composition of claim 1 wherein the water is present at about 5 to 15% by weight of the total coating.

14. The coating composition of claim 1 wherein the coating also comprises an organic solvent.

15. The coating composition of claim 14 wherein the organic solvent is present at a level of 1 to about 10% by weight of the total weight of the coating composition.

16. A process for improving the abrasion resistance of a substrate which process comprises applying to at least one surface of the substrate an aqueous coating composition, allowing the coating to flash at ambient temperature, and polymerizing the coating by treatment with an effective amount of actinic radiation; wherein the radiation polymerizable coating comprises:

(i) ethylenically unsaturated silane treated silica;

(ii) at least one water dispersible polyacrylate;

(iii) water dispersible ethylenically unsaturated oligomer; and

(iv) water.

CLAIMS

1. A radiation polymerizable aqueous coating composition comprising on a weight solids basis based upon the combined total weight solids of (i) and (ii) and (iii):

(i) 10-60% of ethylenically unsaturated silane treated silica;

(ii) 10-60% of at least one water dispersible polyacrylate; and

(iii) 5-60% water dispersible ethylenically unsaturated oligomer,

and wherein the ethylenically unsaturated silane treated silica was obtained by a process which comprises:

a) admixing an ethylenically unsaturated silane and a catalytic amount of acid with a silica organosol comprising silica dispersed in a water-miscible organic solvent; and

b) gradually adding an ethylenically unsaturated alkoxysilane to the admixture under reactive conditions; and

c) adding at least some of the water dispersible polyacrylate to the admixture while maintaining the admixture at a temperature of at least 30°C.

2. The composition of claim 1 wherein the composition comprises, on a weight solids basis:

(i) 10-35% ethylenically unsaturated silane treated silica;

(ii) 10-35% at least one water dispersible polyacrylate; and

(iii) 5-45% water dispersible ethylenically unsaturated oligomer,

based upon the combined total weight solids of (i) and (ii) and (iii).

3. The composition of claim 1 wherein the composition comprises:

(i) 10-50% ethylenically unsaturated silane treated silica;

(ii) 15-40% water dispersible diacrylate;

(iii) 5-25% water dispersible polyacrylate having an average of more than two acrylate groups per molecule; and

(iv) 5-60% water dispersible ethylenically unsaturated oligomer,

based upon the total weight solids of (i) and (ii) and (iii) and (iv).

4. The composition of claim 1 further characterized in that the composition also contains a catalytic amount of a polymerization catalyst.

5. The coating composition of claim 1 wherein the water dispersible ethylenically unsaturated oligomer comprises an unsaturated hyperbranched polyester.

6. The coating composition of claim 1 wherein the coating also comprises an organic solvent.

7. The coating composition of claim 6 wherein the organic solvent is present at a level of 1 to about 10% by weight of the total weight of the coating composition.

8. A process for improving the abrasion resistance of a substrate which process comprises applying to at least one surface of the substrate an aqueous coating composition, allowing the coating to flash at ambient temperature, and polymerizing the coating by treatment with an effective amount of actinic radiation; wherein the radiation polymerizable coating comprises:

(i) ethylenically unsaturated silane treated silica;

(ii) at least one water dispersible polyacrylate;

(iii) water dispersible ethylenically unsaturated oligomer; and

(iv) water,

and wherein the ethylenically unsaturated silane treated silica was obtained by a process which comprises:

a) admixing an ethylenically unsaturated silane and a catalytic amount of acid with a silica organosol comprising silica dispersed in a water-miscible organic solvent; and

b) gradually adding an ethylenically unsaturated alkoxysilane to the admixture under reactive conditions; and

c) adding at least some of the water dispersible polyacrylate to the admixture while maintaining the admixture at a temperature of at least 30°C.

9. The composition of claim 1 wherein at least some of the water dispersible polyacrylate is added to the admixture while maintaining the admixture at a temperature of at least 60°C.