Claims

1. A composition comprising microparticles having a particle size of from 0.5 μm to 50 μm with less than 20% reflectance of solar radiation.

2. The composition of claim 1, wherein the microparticles comprise nano-sized pores.

3. The composition of claim 2, wherein the nano-sized pores have a pore size of from 1 nm to 500 nm.

4. The composition of any of the preceding claims, wherein the microparticles are comprised of a material selected from the group consisting of silicates, silicon oxides, aluminates, aluminum oxides, zirconium oxides and mixtures thereof.

5. A coating comprising a polymer matrix, microparticles having a particle size of from 0.5 μm to 50 μm and a dispersant to disperse said microparticles in said polymer matrix, wherein the coating has less than 20% reflectance of solar radiation.

6. The coating of claim 5, wherein the polymer matrix is selected from the group consisting of a solvent-based organic polymer matrix and a water-based acrylic polymer matrix.

7. The coating of any one of claims 5-6, wherein the disperser comprises butanol.

8. The coating of any one of claims 5-7, wherein the microparticles are present in an amount from 10 wt% to 40 wt% of the total weight of the coating.

9. The coating of any one of claims 5-8, wherein the polymer matrix is present in an amount from 50 wt% to 80 wt% of the total weight of the coating.

10. The coating of any one of claims 5-9, wherein the disperser is present in an amount from 5 wt% to 20 wt% of the total weight of the coating.

11. A method of producing a coating having less than 20% reflectance of solar radiation, the method comprising the steps of:

a. providing particles having an initial particle size of from 0.5 μm to 150 μm;

b. mixing the particles having an initial particle size of from 0.5 μm to 150 μm with a polymer matrix and a dispersant to obtain a substantially homogenous mixture; and

c. comminuting the particles in said homogenous mixture to obtain the coating, wherein the coating comprises comminuted microparticles having a particle size of from 0.5 μm to 50 μm.

12. The method of claim 11, wherein the comminuting step comprises a high shear process step.

13. The method of claim 12, wherein the high shear process step is undertaken for a duration of 30 minutes to 120 minutes.

14. The method of any one of claims 12-13, wherein the high shear process step is undertaken at atmospheric temperature and pressure.

15. The method of any one of claims 11-14, wherein the comminuted microparticles comprise nano-sized pores.

16. The method of any one of claims 11-15, wherein the particles having an initial particle size of from 0.5 μm to 150 μm are comprised of a material selected from the group consisting of silicates, silicon oxides, aluminates, aluminum oxides, zirconium oxides and mixtures thereof.

17. A heat exchanging system comprising at least one substrate coated with the coating of any one of claims 5-10, wherein said at least one substrate is in thermal communication with a fluid.

18. The heat exchanging system of claim 17, wherein the fluid is a heat exchange fluid adapted to absorb heat transferred from said at least one substrate.

19. The heat exchanging system of any one of claims 17-18, wherein said system is adapted to receive heat energy from solar radiation.

Claims

1. A coating composition comprising a polymer matrix, comminuted microparticles having a particle size of from 0.5 μm to 50 μm and a dispersant to disperse said comminuted microparticles in said polymer matrix, wherein the comminuted microparticles comprise nano-sized pores, wherein the comminuted microparticles are present in an amount from 10 wt% to 40 wt% of the total weight of the coating composition, and wherein said coating composition has less than 20% reflectance of solar radiation.

2. The coating composition of claim 1, wherein the polymer matrix is selected from the group consisting of a solvent-based organic polymer matrix and a water-based acrylic polymer matrix.

3. The coating composition of any one of the preceding claims, wherein the dispersant comprises butanol.

4. The coating composition of any one of the preceding claims, wherein the polymer matrix is present in an amount from 50 wt% to 80 wt% of the total weight of the coating composition.

5. The coating composition of any one of the preceding claims, wherein the dispersant is present in an amount from 5 wt% to 20 wt% of the total weight of the coating composition.

6. The coating composition of any one of the preceding claims, wherein the nano-sized pores have a pore size of from 1 nm to 500 nm.

7. The composition of any of the preceding claims, wherein the comminuted microparticles are comprised of a material selected from the group consisting of silicates, silicon oxides, aluminates, aluminum oxides, zirconium oxides and mixtures thereof.

8. The composition of any one of the preceding claims, wherein the comminuted microparticles are comprised of a mixture of silicates, silicon oxides, aluminates, aluminum oxides and zirconium oxides.

9. The coating composition of any one of the preceding claims when used to prepare a coating having less than 20% reflectance of solar radiation.

10. A method of producing a coating composition having less than 20% reflectance of solar radiation, the method comprising the steps of:

a. providing particles having an initial particle size of from 0.5 μm to 150 μm;

b. mixing the particles having an initial particle size of from 0.5 μm to 150 μm with a polymer matrix and a dispersant to obtain a substantially homogenous mixture, wherein the particles are selected to be present in an amount from 10 wt% to 40 wt% of the total weight of the mixture; and

c. comminuting the particles in said homogenous mixture to obtain the coating composition, wherein the coating composition comprises comminuted microparticles having a particle size of from 0.5 μm to 50 μm and wherein

the comminuted microparticles comprise nano-sized pores.

11. The method of claim 10, wherein the comminuting step comprises a high shear process step.

12. The method of claim 11, wherein the high shear process step is undertaken for a duration of 30 minutes to 120 minutes.

13. The method of any one of claims 11-12, wherein the high shear process step is undertaken at atmospheric temperature and pressure.

14. The method of any one of claims 10-13, wherein the particles having an initial particle size of from 0.5 μm to 150 μm are comprised of a material selected from the group consisting of silicates, silicon oxides, aluminates, aluminum oxides, zirconium oxides and mixtures thereof.

15. A heat exchanging system comprising at least one substrate coated with the coating composition of any one of claims 1-9, wherein said at least one substrate is in thermal communication with a fluid.

16. The heat exchanging system of claim 15, wherein the fluid is a heat exchange fluid adapted to absorb heat transferred from said at least one substrate.

17. The heat exchanging system of any one of claims 15-16, wherein said system is adapted to receive heat energy from solar radiation.

18. Paint comprising a coating composition of any one of claims 1-9.