Claims

1. A process for forming a fiber-cement composite sheet, comprising the steps of:

a) providing at least two slurry compositions separately in at least two mixing tanks for forming the fiber-cement composite sheet comprising at least two composite layers, where

- the first slurry composition is used for forming a base layer of the fiber-cement composite sheet;
- a second slurry composition, different from the first slurry composition, used for forming a surface layer of the fiber-cement composite sheet ;

b) separately feeding each slurry composition of step a) from each mixing tank into at least two sieves, wherein each sieve contains one slurry composition;

c) forming the composite layers using Hatschek process by conveying the slurry compositions from each sieve to a roller for forming the base layer, and forming the surface layer; and

d) curing the composite layers until the fiber-cement composite sheet is obtained;

wherein the first slurry composition in step a) comprises:

a cement material in an amount from 1 to 10 % w/v;

a siliceous material in an amount from 1 to 10 % w/v;

a filler in an amount from 0.1 to 10 % w/v;

a long fiber in an amount from 0.1 to 2 % w/v, wherein the long fiber is a fiber that has an average length from 1.5 to 4 mm and average diameter from 20 to 40 μm; and

a medium up to 100 % w/v;

and wherein the second slurry composition in step a) comprises:

the cement material in an amount from 1 to 10 % w/v;

the siliceous material in an amount from 1 to 10 % w/v;

the filler in an amount from 0.1 to 10 % w/v;

a short fiber in an amount from 0.005 to 1.5 % w/v, wherein the short fiber is a fiber that has an average length from 0.5 to 1.5 mm and average diameter from 5 to 15 μm; and

the medium up to 100 % w/v.

2. The process for forming the fiber-cement composite sheet according to claim 1, wherein the second slurry composition further comprises the long fiber in an amount from 0.005 to 1.5 % w/v.

3. The process for forming the fiber-cement composite sheet according to claim 1, wherein the first slurry composition comprises:

the cement material in an amount from 1 to 8 % w/v;

the siliceous material in an amount from 1 to 8 % w/v;

the filler in an amount from 0.3 to 5 % w/v;

the long fiber in an amount from 0.1 to 1.5 % w/v; and

the medium up to 100 % w/v.

4. The process for forming the fiber-cement composite sheet according to claim 2, wherein the second slurry composition comprises:

the cement material in an amount from 1.7 to 7 % w/v;

the siliceous material in an amount from 1.7 to 7 % w/v;

the filler in an amount from 0.3 to 2 % w/v;

the long fiber in an amount from 0.15 to 1.1 % w/v;

the short fiber in an amount from 0.01 to 0.2 % w/v; and

the medium up to 100 % w/v.

5. The process for forming the fiber-cement composite sheet according to claim 1, wherein in step c) the thickness ratio of the base layer to the surface layer is from 1:0.1 to 1:1.

6. The process for forming the fiber-cement composite sheet according to claim 5, wherein in step c) the thickness ratio of the base layer to the surface layer is from 1:0.4 to 1:0.6.

7. The process for forming the fiber-cement composite sheet according to claim 1, wherein the first slurry composition further comprises an additive in an amount from 0.1 to 30 % wt of the cement material, where the additive is selected from pigment, preservative, luminescence, bulking agent, defoaming agent, dispersing agent, reinforcing agent, flow rate adjusting agent, flame resisting agent, adhesive, anti-slip agent, and catalyst or inhibitor, or mixture thereof.

8. The process for forming the fiber-cement composite sheet according to claim 1, wherein the second slurry composition further comprises the additive in an amount from 0.1 to 30 % wt of the cement material, where the additive is selected from pigment,

preservative, luminescence. bulking agent, defoaming agent, dispersing agent, reinforcing agent, flow rate adjusting agent, flame resisting agent, adhesive, anti-slip agent, and catalyst or inhibitor.

9. The process for forming the fiber-cement composite sheet according to claim 1, wherein the step c) can be repeated to increase the thickness of the base layer and the surface layer.

10. The process for forming the fiber-cement composite sheet according to claim 1, wherein said process further comprises the step of forming a coating material on the surface layer, where the amount of the coating material is 1.8 to 2.5 g/cm^2.

11. The process for forming the fiber-cement composite sheet according to claim 1, wherein step a) further comprises a step of providing a third slurry composition for forming at least one intermediate layer, where the slurry composition comprises:

the cement material in an amount from 1 to 10 % w/v;

the siliceous material in an amount from 1 to 10 % w/v;

the filler in an amount from 0.5 to 10 % w/v; and

the medium up to 100 % w/v.

12. The process for forming the fiber-cement composite sheet according to claim 11, wherein the slurry composition for forming the intermediate layer further comprises a fiber in an amount from 0.005 to 1.2% w/v, where the fiber is selected from long fiber, short fiber, recycled fiber, or combination thereof.

13. A fiber-cement composite sheet formed by a process comprising the steps of:

a) providing at least two slurry compositions separately in at least two mixing tanks for forming the fiber-cement composite sheet comprising at least two composite layers, where

- the first slurry composition is used for forming a base layer of the fiber-cement composite sheet;
- a second slurry composition, different from the first slurry composition, is used for forming a surface layer of the fiber-cement composite sheet;

b) separately feeding each slurry composition of step a) from each mixing tank into at least two sieves, wherein each sieve contains one slurry composition;

c) forming the composite layers using Hatschek process by conveying the slurry compositions from each sieve to a roller for forming the base layer, and forming the surface layer; and

d) curing the composite layers until the fiber-cement composite sheet is obtained;

wherein the first slurry composition in step a) comprises:

a cement material in an amount from 1 to 10 % w/v;

a siliceous material in an amount from 1 to 10 % w/v;

a filler in an amount from 0.1 to 10 % w/v;

a long fiber in an amount from 0.1 to 2 % w/v, wherein the long fiber is a fiber that has an average length from 1.5 to 4 mm and average diameter from 20 to 40 μm; and

a medium up to 100 % w/v;

and wherein the second slurry composition in step a) comprises:

the cement material in an amount from 1 to 10 % w/v;

the siliceous material in an amount from 1 to 10 % w/v;

the filler in an amount from 0.1 to 10 % w/v;

a short fiber in an amount from 0.005 to 1.5 % w/v, wherein the short fiber is a fiber that has an average length from 0.5 to 1.5 mm and average diameter from 5 to 15 μm; and

the medium up to 100 % w/v.

14. The fiber-cement composite sheet according to claim 13, wherein the second slurry composition further comprises the long fiber in an amount from 0.005 to 1.5 % w/v.

15. The fiber-cement composite sheet according to claim 13, wherein the first slurry composition comprises:

the cement material in an amount from 1 to 8 % w/v;

the siliceous material in an amount from 1 to 8 % w/v;

the filler in an amount from 0.3 to 5 % w/v;

the long fiber in an amount from 0.1 to 1.5 % w/v; and

the medium up to 100 % w/v.

16. The fiber-cement composite sheet according to claim 14, wherein the second slurry composition comprises:

the cement material in an amount from 1.7 to 7 % w/v;

the siliceous material in an amount from 1.7 to 7 % w/v;

the filler in an amount from 0.3 to 2 % w/v;

the long fiber in an amount from 0.15 to 1.1 % w/v;

the short fiber in an amount from 0.01 to 0.2 % w/v; and

the medium up to 100 % w/v.

17. The fiber-cement composite sheet according to claim 13, wherein the step c) the thickness ratio of the base layer to the surface layer is from 1:0.1 to 1:1.

18. The fiber-cement composite sheet according to claim 17, wherein the step c) the thickness ratio of the base layer to the surface layer is from 1:0.4 to 1:0.6.

19. The fiber-cement composite sheet according to claim 13, wherein the first slurry composition comprises an additive from 0.1 to 30 % wt of the cement material, where the additive is selected from pigment, preservative, luminescence, bulking agent, defoaming agent, dispersing agent, reinforcing agent, flow rate adjusting agent, flame resisting agent, adhesive, anti-slip agent, and catalyst or inhibitor, or mixture thereof.

20. The fiber-cement composite sheet according to claim 13, wherein the second slurry composition comprises the additive from 0.1 to 30 % wt of the cement material, where the additive is selected from pigment, preservative, luminescence. bulking agent, defoaming agent, dispersing agent, reinforcing agent, flow rate adjusting agent, flame resisting agent, adhesive, anti-slip agent, and catalyst or inhibitor.

21. The fiber-cement composite sheet according to claim 13, wherein the step c) can be repeated to increase the thickness of the base layer and the surface layer on the roller.

22. The fiber-cement composite sheet according to claim 13, wherein said fiber-cement composite sheet has a roughness from 7 to 13 μm.

23. The fiber-cement composite sheet according to claim 13, wherein the fiber-cement composite sheet further comprises a coating material, where the amount of the coating material is 1.8 to 2.5 g/cm^2.

24. The fiber-cement composite sheet according to claim 13, wherein the forming in step a) further comprises a step of providing a third slurry composition for forming at least one intermediate layer, where the slurry composition comprises:

the cement material in an amount from 1 to 10 % w/v;

the siliceous material in an amount from 1 to 10 % w/v;

the filler in an amount from 0.5 to 10 % w/v; and

the medium up to 100 % w/v.

25. The fiber-cement composite sheet according to claim 24, wherein the slurry composition for forming the intermediate layer further comprises fiber in an amount from 0.005 to 1.2% w/v, where the fiber is selected from long fiber, short fiber, recycled fiber, or combination thereof.