What is claimed is:

1. A filtration medium with protective function against chemical and biological contaminants, the filtration medium comprising:

a first nanofiber layer comprising a first metal compound and a first binder for covalently bonding with the first metal compound, wherein the first metal compound is in an ionic form is capable of attracting and destroying the biological contaminants;

a second nanofiber layer comprising a second metal compound and a second binder for covalently bonding with the second metal compound, wherein the second metal compound is in an ionic form is capable of attracting and destroying the biological contaminants; and

a middle nanofiber layer disposed between the first and second nanofiber layers, the middle nanofiber layer comprising a metal oxide compound and a polymer which acts as a binder for bonding with the metal oxide compound, wherein the metal oxide compound is capable of reacting with the chemical contaminants through a catalysis mechanism to form at least one chemical by-product and regenerate the metal oxide compound.

2. The filtration medium of claim 1, the content of the metal oxide compound of the middle nanofiber layer is between the range of about 1 wt% to about 67 wt%, wherein the filtration medium with about 67 wt% of metal oxide compound is capable of achieving about 95% detoxification of the chemical contaminants.

3. The filtration medium of claim 1, the ratio of the metal oxide compound to the polymer of the middle nanofiber layer is about 67:33 wt%.

4. The filtration medium of claim 1, the content of the first metal compound of the first nanofiber layer is between the range of about 1 wt% to about 12 wt% which is capable of achieving about 100% disinfection of the biological contaminants.

5. The filtration medium of claim 1, the content of the second metal compound in the second nanofiber layer is between the range of about 1 wt% to about 12 wt% which is capable of achieving about 100% disinfection of the biological contaminants.

6. The filtration medium of claim 1, wherein the first nanofiber layer comprises a plurality of first nanofibers with each first nanofiber having a plurality of first metal nanoparticles made of the first metal compound.

7. The filtration medium of claim 1, wherein the second nanofiber layer comprises a plurality of second nanofibers with each second nanofiber having a plurality of second metal nanoparticles made of the second metal compound.

8. The filtration medium of claim 1, wherein the middle nanofiber layer comprises a plurality of middle nanofibers with each middle nanofiber having a plurality of metal oxide nanoparticles made of the metal oxide compound.

9. The filtration medium of claim 8, the size of each of the plurality of metal oxide nanoparticles determines the rate of the catalysis mechanism.

10. The filtration medium of claim 8, the number of the plurality of metal oxide nanoparticles determines the rate of the catalysis mechanism.

11. The filtration medium of claim 1, the thickness of the first nanofiber layer is between the range of 5 μm to 100 μm.

12. The filtration medium of claim 1, the thickness of the second nanofiber layer is between the range of 5 μm to 100 μm.

13. The filtration medium of claim 1, the thickness of the middle nanofiber layer is between the range of 10 μm to 100 μm.

14. The filtration medium of claim 1, wherein the first metal compound comprises silver.

15. The filtration medium of claim 1, wherein the second metal compound comprises silver.

16. The filtration medium of claim 1, wherein the metal oxide compound comprises aluminium oxide.

17. The filtration medium of claim 16, wherein the chemical contaminants are paraoxon which can be decomposed by aluminium oxide of the middle nanofiber layer to form the at least one chemical by-product that is at least one of p-nitrophenol, ethanol, and orthophosphoric acid.

18. The filtration medium of claim 1, wherein the first binder of the first nanofiber layer is a poly(acrylic acid).

19. The filtration medium of claim 1, wherein the second binder of the second nanofiber layer is a poly(acrylic acid).

20. The filtration medium of claim 1, wherein the polymer of the middle nanofiber layer is a polyvinylidene fluoride.

21. The filtration medium of claim 1, wherein the first nanofiber layer further comprising a first medicinal substance for medical treatment.

22. The filtration medium of claim 21, the outer surface of the first medicinal substance is being coated by at least one polymer.

23. The filtration medium of claim 1, wherein the second nanofiber layer further comprising a second medicinal substance for medical treatment.

24. The filtration medium of claim 23, the outer surface of the second medicinal substance is being coated by at least one polymer.

25. The filtration medium of claim 1, further comprising:

a membrane sensor that changes colour in response to exposure to carbon dioxide for indicating the lifetime of the filtration medium.

26. The filtration medium of claim 25, wherein the membrane sensor is made of a combination of a plurality of dyes.

27. The filtration medium of claim 1, wherein the first nanofiber layer, the second nanofiber layer, and the middle nanofiber layer are bound together by heat pressing at a temperature between 100 °C and 170 °C.

28. The filtration medium of claim 1, wherein the filtration medium is in a form of membrane.

29. A method of producing a filtration medium with protective function against chemical and biological contaminants, the method comprising the steps of:

forming a first nanofiber layer which comprising a first metal compound and a first binder for covalently bonding with the first metal compound;

forming a middle nanofiber layer which comprising a metal oxide compound and a polymer which acts as a binder for bonding with the metal oxide compound;

forming a second nanofiber layer which comprising a second metal compound and a second binder for covalently bonding with the second metal compound;

binding the first nanofiber layer to a first side of the middle nanofiber layer; and

binding the second nanofiber layer to a second side of the middle nanofiber layer.

30. The method of claim 29, wherein the step of forming the first nanofiber layer comprises:

electrospinning a mixture comprising the first metal compound, the first binder and a polymer to form a plurality of first nanofibers.

31. The method of claim 29, wherein the step of forming the second nanofiber layer comprises:

electrospinning a mixture comprising the second metal compound, the second binder and a polymer to form a plurality of second nanofibers.

32. The method of claim 29, wherein the step of forming the middle nanofiber layer comprises:

electrospinning a mixture comprising the metal oxide compound and the polymer to form a plurality of middle nanofibers.

33. The method of claim 29, wherein the step of binding the first nanofiber layer to the first side of the middle nanofiber layer comprises:

heat pressing the first nanofiber layer to the middle nanofiber layer at a temperature between 100 °C and 170 °C.

34. The method claim 29, wherein the step of binding the second nanofiber layer to the second side of the middle nanofiber layer comprises:

heat pressing the second nanofiber layer to the middle nanofiber layer at a temperature between 100 °C and 170 °C.

35. The method of claim 29, further comprising a step of:

adding a first medicinal substance to the first nanofiber layer.

36. The method of claim 35, wherein the step of adding the first medicinal substance to the first nanofiber layer comprises:

core-shell electrospinning the first medicinal substance and a polymer to form a plurality of medicated nanofibers, wherein the first medicinal substance forms the core of each of the plurality of medicated nanofibers and the polymer forms the shell of each of the plurality medicated nanofibers.

37. The method of claim 35, wherein the step of adding the first medicinal substance to the first nanofiber layer comprises:

core-shell electrospinning the first medicinal substance and a first mixture comprising the first metal compound, the first binder and a polymer to form a plurality of medicated nanofibers, wherein the first medicinal substance forms the core of each of the plurality of medicated nanofibers and the first mixture forms the shell of each of the plurality of medicated nanofibers.

38. The method of claim 29, further comprising a step of:

adding a second medicinal substance to the second nanofiber layer.

39. The method of claim 38, wherein the step of adding the second medicinal substance to the second nanofiber layer comprises:

core-shell electrospinning the second medicinal substance and a polymer to form a plurality of medicated nanofibers, wherein the second medicinal substance forms the core of each of the plurality of medicated nanofibers and the polymer forms the shell of each of the plurality of medicated nanofibers.

40. The method of claim 38, wherein the step of adding the second medicinal substance to the second nanofiber layer comprises:

core-shell electrospinning the second medicinal substance and a second mixture comprising the second metal compound, the second binder and a polymer to form a plurality of medicated nanofibers, wherein the second medicinal substance forms the core of each of the plurality of medicated nanofibers and the second mixture forms the shell of each of the plurality of medicated nanofibers.

41. An article comprising a filtration medium according to any one of preceding claims 1 to 40.

42. Use of the article of claim 41, for detoxifying chemical and biological contaminants.

What is claimed is:

1. A filtration medium with protective function against chemical and biological contaminants, the filtration medium comprising:

a middle nanofiber layer having a first surface and a second surface, the middle nanofiber layer comprising roughly spun polymer nanofibres bonded to nanoparticles of a metal oxide compound, wherein the metal oxide compound is capable of reacting with the chemical contaminants through a catalysis mechanism to form at least one chemical by-product and regenerate the metal oxide compound;

a first nanofiber layer disposed on the first surface of the middle nanofibre layer, the first nanofibre layer comprising a first metal compound and a first binder covalently bonded with the first metal compound, wherein the first metal compound is in an ionic form and is capable of attracting and destroying the biological contaminants; and

a second nanofiber layer disposed on the second surface of the middle nanofibre layer, the second nanofibre layer comprising a second metal compound and a second binder covalently bonded with the second metal compound, wherein the second metal compound is in an ionic form and is capable of attracting and destroying the biological contaminants.

2. The filtration medium of claim 1, the content of the metal oxide compound of the middle nanofiber layer is between the range of about 1 wt% to about 67 wt%, wherein the filtration medium with about 67 wt% of metal oxide compound is capable of achieving about 95% detoxification of the chemical contaminants.

3. The filtration medium of claim 1, the ratio of the metal oxide compound to the polymer of the middle nanofiber layer is about 67:33 wt%.

4. The filtration medium of claim 1, the content of the first metal compound of the first nanofiber layer is between the range of about 1 wt% to about 12 wt% which is capable of achieving about 100% disinfection of the biological contaminants.

5. The filtration medium of claim 1, the content of the second metal compound in the second nanofiber layer is between the range of about 1 wt% to about 12 wt% which is capable of achieving about 100% disinfection of the biological contaminants.

6. The filtration medium of claim 1, wherein the first nanofiber layer comprises a plurality of first nanofibers with each first nanofiber having a plurality of first metal nanoparticles made of the first metal compound.

7. The filtration medium of claim 1, wherein the second nanofiber layer comprises a plurality of second nanofibers with each second nanofiber having a plurality of second metal nanoparticles made of the second metal compound.

8. The filtration medium of claim 1, wherein the middle nanofiber layer comprises a plurality of middle nanofibers with each middle nanofiber having a plurality of metal oxide nanoparticles made of the metal oxide compound.

9. The filtration medium of claim 8, the size of each of the plurality of metal oxide nanoparticles determines the rate of the catalysis mechanism.

10. The filtration medium of claim 8, the number of the plurality of metal oxide nanoparticles determines the rate of the catalysis mechanism.

11. The filtration medium of claim 1, the thickness of the first nanofiber layer is between the range of 5 µm to 100 µm.

12. The filtration medium of claim 1, the thickness of the second nanofiber layer is between the range of 5 µm to 100 µm.

13. The filtration medium of claim 1, the thickness of the middle nanofiber layer is between the range of 10 µm to 100 µm.

14. The filtration medium of claim 1, wherein the first metal compound comprises silver.

15. The filtration medium of claim 1, wherein the second metal compound comprises silver.

16. The filtration medium of claim 1, wherein the metal oxide compound comprises aluminium oxide.

17. The filtration medium of claim 16, wherein the chemical contaminants are paraoxon which can be decomposed by aluminium oxide of the middle nanofiber layer to form the at least one chemical by-product that is at least one of p-nitrophenol, ethanol, and orthophosphoric acid.

18. The filtration medium of claim 1, wherein the first binder of the first nanofiber layer is a poly(acrylic acid).

19. The filtration medium of claim 1, wherein the second binder of the second nanofiber layer is a poly(acrylic acid).

20. The filtration medium of claim 1, wherein the polymer of the middle nanofiber layer is a polyvinylidene fluoride.

21. The filtration medium of claim 1, wherein the first nanofiber layer further comprising a first medicinal substance for medical treatment.

22. The filtration medium of claim 21, the outer surface of the first medicinal substance is being coated by at least one polymer.

23. The filtration medium of claim 1, wherein the second nanofiber layer further comprising a second medicinal substance for medical treatment.

24. The filtration medium of claim 23, the outer surface of the second medicinal substance is being coated by at least one polymer.

25. The filtration medium of claim 1, further comprising:

a membrane sensor that changes colour in response to exposure to carbon dioxide for indicating the lifetime of the filtration medium.

26. The filtration medium of claim 25, wherein the membrane sensor is made of a combination of a plurality of dyes.

27. The filtration medium of claim 1, wherein the first nanofiber layer, the second nanofiber layer, and the middle nanofiber layer are bound together by heat pressing at a temperature between 100 $^{\circ}$C and 170 $^{\circ}$C.

28. The filtration medium of claim 1, wherein the filtration medium is in a form of membrane.

29. A method of producing a filtration medium with protective function against chemical and biological contaminants, the method comprising the steps of:

forming a middle nanofiber layer with roughly spun nanofibres, the middle nanofibre layer comprising nanoparticles of a metal oxide compound and a polymer which acts as a binder for bonding with the metal oxide compound, wherein the middle nanofibre layer has a first surface and a second surface;

forming a first nanofiber layer comprising a first metal compound and a first binder for covalently bonding with the first metal compound;

forming a second nanofiber layer comprising a second metal compound and a second binder for covalently bonding with the second metal compound;

binding the first nanofiber layer to the first surface of the middle nanofiber layer; and

binding the second nanofiber layer to the second surface of the middle nanofiber layer.

30. The method of claim 29, wherein the step of forming the first nanofiber layer comprises:

electrospinning a mixture comprising the first metal compound, the first binder and a polymer to form a plurality of first nanofibers.

31. The method of claim 29, wherein the step of forming the second nanofiber layer comprises:

electrospinning a mixture comprising the second metal compound, the second binder and a polymer to form a plurality of second nanofibers.

32. The method of claim 29, wherein the step of forming the middle nanofiber layer comprises:

electrospinning a mixture comprising the nanoparticles of the metal oxide compound and the polymer to form a plurality of roughly spun middle nanofibers.

33. The method of claim 29, wherein the step of binding the first nanofiber layer to the first side of the middle nanofiber layer comprises:

heat pressing the first nanofiber layer to the middle nanofiber layer at a temperature between 100 °C and 170 °C.

34. The method claim 29, wherein the step of binding the second nanofiber layer to the second side of the middle nanofiber layer comprises:

heat pressing the second nanofiber layer to the middle nanofiber layer at a temperature between 100 °C and 170 °C.

35. The method of claim 29, further comprising a step of:

adding a first medicinal substance to the first nanofiber layer.

36. The method of claim 35, wherein the step of adding the first medicinal substance to the first nanofiber layer comprises:

core-shell electrospinning the first medicinal substance and a polymer to form a plurality of medicated nanofibers, wherein the first medicinal substance forms the core of each of the plurality of medicated nanofibers and the polymer forms the shell of each of the plurality medicated nanofibers.

37. The method of claim 35, wherein the step of adding the first medicinal substance to the first nanofiber layer comprises:

core-shell electrospinning the first medicinal substance and a first mixture comprising the first metal compound, the first binder and a polymer to form a plurality of medicated nanofibers, wherein the first medicinal substance forms the core of each of the plurality of medicated nanofibers and the first mixture forms the shell of each of the plurality of medicated nanofibers.

38. The method of claim 29, further comprising a step of:

adding a second medicinal substance to the second nanofiber layer.

39. The method of claim 38, wherein the step of adding the second medicinal substance to the second nanofiber layer comprises:

core-shell electrospinning the second medicinal substance and a polymer to form a plurality of medicated nanofibers, wherein the second medicinal substance forms the core of each of the plurality of medicated nanofibers and the polymer forms the shell of each of the plurality of medicated nanofibers.

40. The method of claim 38, wherein the step of adding the second medicinal substance to the second nanofiber layer comprises:

core-shell electrospinning the second medicinal substance and a second mixture comprising the second metal compound, the second binder and a polymer to form a plurality of medicated nanofibers, wherein the second medicinal substance forms the core of each of the plurality of medicated nanofibers and the second mixture forms the shell of each of the plurality of medicated nanofibers.