CLAIMS

1. A method of forming a fiber, the method comprising:

forming a wet spun fiber from a plurality of MXene sheets using a wet spinning process; and

forming the fiber by heating the wet spun fiber using a thermal drawing process;

wherein the fiber is a cross-linked MXene-based fiber comprising a MXene core comprising the plurality of MXene sheets which are cross-linked; and

wherein the fiber further comprises a protective layer surrounding the MXene core;

wherein forming the wet spun fiber from the plurality of MXene sheets comprises:

forming an intermediate fiber by extruding a spinning dispersion comprising the plurality of MXene sheets into a coagulant bath; and

forming the wet spun fiber by passing the intermediate fiber through a cross-linking solution;

wherein the spinning dispersion further comprises glutaraldehyde (GA) such that the intermediate fiber formed is a cross-linked MXene-glutaraldehyde (GA) fiber; and

wherein the cross-linking solution comprises polyvinyl alcohol (PVA) such that the wet spun fiber formed is a cross-linked MXene-glutaraldehyde (GA) – polyvinyl alcohol (PVA) fiber;

wherein the plurality of MXene sheets are $Ti_3C_2T_x$ sheets;

wherein Ti is titanium;

wherein C is carbon;

wherein T is a functional group; and

wherein x is any number.

2. The method according to claim 1, further comprising:

passing the intermediate fiber through a first washing bath before forming the wet spun fiber; and

passing the wet spun fiber through a second washing bath before forming the cross-linked MXene-based fiber.

3. The method according to claim 2,

wherein the first washing bath and the second washing bath comprise deionized water.

4. The method according to any one of claims 1 to 3, further comprising:

wherein the protective layer is a polymer layer.

5. The method according to any one of claims 1 to 4,

wherein the $Ti_3C_2T_x$ sheets are formed from Ti_3AlC_2.

6. The method according to any one of claims 1 to 5,

wherein the plurality of MXene sheets are nanosheets.

7. The method according to any one of claims 1 to 6,

wherein the cross-linked MXene-based fiber has an electrical conductivity selected from a range of between 8,000 S cm^{-1} and 9,000 S cm^{-1}.

8. The method according to any one of claims 1 to 7,

wherein the thermal drawing process comprises feeding the wet spun fiber into a tube passing through a furnace.

9. The method according to claim 8,

wherein the furnace has a hot zone having a temperature of 200 °C.

10. The method according to any one of claims 1 to 9,

wherein a ratio of pull to feed speed of the thermal drawing process is of any value selected from a range of between 1.2 and 1.5.

11. The method according to any one of claims 1 to 10,

wherein the cross-linked MXene-based fiber shows a porosity selected from a range of between 5.5 % to 9 %.

12. The method according to any one of claims 1 to 11,

wherein the cross-linked MXene-based fiber shows an orientation order selected from a range of between 0.8 to 0.9.

13. The method according to any one of claims 1 to 12,

wherein the cross-linked MXene-based fiber shows an absorption electromagnetic interference (EMI) shielding efficiency (SE) selected from a range of between 40 dB to 55 dB.

14. The method according to any one of claims 1 to 13,

wherein the cross-linked MXene-based fiber shows a total electromagnetic interference (EMI) shielding efficiency (SE) selected from a range of between 50 dB to 65 dB.

15. The method according to any one of claims 1 to 14,

wherein the cross-linked MXene-based fiber comprising the protective layer is configured to reach an equilibrium temperature selected from a range of between 90 °C to 100 °C within 300 s upon applying a direct current (DC) voltage of 6 V.

16. A fiber comprising:

a MXene core; and

a protective layer surrounding the MXene core;

wherein the fiber is a cross-linked MXene-based fiber such that the MXene core comprises a plurality of MXene sheets which are cross-linked;

wherein the fiber is a cross-linked MXene- glutaraldehyde (GA) – polyvinyl alcohol (PVA) fiber;

wherein the fiber is formed by forming a wet spun fiber from a plurality of MXene sheets using a wet spinning process;

wherein the fiber is further formed by heating the wet spun fiber using a thermal drawing process;

wherein the wet spun fiber is formed from the plurality of MXene sheets by a method comprising:

forming an intermediate fiber by extruding a spinning dispersion comprising the plurality of MXene sheets into a coagulant bath; and

forming the wet spun fiber by passing the intermediate fiber through a cross-linking solution;

wherein the spinning dispersion further comprises glutaraldehyde (GA) such that the intermediate fiber formed is a cross-linked MXene-glutaraldehyde (GA) fiber; and

wherein the cross-linking solution comprises polyvinyl alcohol (PVA) such that the wet spun fiber formed is a cross-linked MXene-glutaraldehyde (GA) – polyvinyl alcohol (PVA) fiber;

wherein the plurality of MXene sheets are $Ti_3C_2T_x$ sheets;

wherein Ti is titanium;

wherein C is carbon;

wherein T is a functional group; and

wherein x is any number.

17. The fiber according to claim 16,

wherein the protective layer is a polymer layer.

18. The fiber according to claim 16 or claim 17,

wherein the cross-linked MXene-based fiber has an electrical conductivity selected from a range of between 8,000 S cm^{-1} and 9,000 S cm^{-1}.

19. The fiber according to any one of claims 16 to 18,

wherein the cross-linked MXene-based fiber shows a porosity selected from a range of between 5.5 % to 9 %.

20. The fiber according to any one of claims 16 to 19,

wherein the cross-linked MXene-based fiber shows an orientation order selected from a range of between 0.8 to 0.9.

21. The fiber according to any one of claims 16 to 20,

wherein the cross-linked MXene-based fiber shows an absorption electromagnetic interference (EMI) shielding efficiency (SE) selected from a range of between 40 dB to 55 dB.

22. The fiber according to any one of claims 16 to 21,

wherein the cross-linked MXene-based fiber shows a total electromagnetic interference (EMI) shielding efficiency (SE) selected from a range of between 50 dB to 65 dB.

23. The fiber according to any one of claims 16 to 22,

wherein the cross-linked MXene-based fiber comprising the protective layer is configured to each an equilibrium temperature selected from a range of between 90 °C to 100 °C within 300 s upon applying a direct current (DC) voltage of 6 V.