CLAIMS:

1. A process of making a graphene material-metal nanocomposite comprising:

forming a layer of graphene-precursor material on at least a portion of a surface of or all of the surfaces of metal nanowires comprising forming a dispersion of a metal precursor and a graphene-precursor material; and

calcining the metal nanowires comprising a layer of graphene-precursor material,

wherein the graphene material-metal nanocomposite is formed.

2. The process of claim 1, wherein the forming a layer of graphene-precursor material on at least a portion of a surface of or all of the surfaces of metal nanowires comprises:

forming a dispersion of metal nanowires and the graphene-precursor material.

3. The process of claim 2, wherein the forming a dispersion of metal nanowires and the graphene-precursor material comprises:

dispersing metal nanowires in a dispersant; and

dispersing graphene-precursor material in a dispersant, and adding the metal nanowire dispersion to the graphene-precursor material dispersion.

4. The process of claim 2, wherein the metal nanowires are present at 95 to 99 wt.% (based on the total weight of metal nanowires and graphene-precursor material) in the dispersion.

5. The process of claim 2, wherein the graphene-precursor material is present 1 to 5 wt.% (based on the total weight of metal nanowires and graphene-precursor material) in the dispersion.

6. The process of claim 2, wherein the dispersant of the dispersion is water, a C1 to C6 alcohol, or a combination thereof.

7. The process of claim 2, wherein the ratio of the metal nanowire weight to the graphene-precursor material weight is 95:5 to 99: 1.

8. The process of claim 2, wherein the metal nanowires are chosen from copper nanowires, aluminum nanowires, copper alloy wires, and combinations thereof.

9. The process of claim 1, wherein the forming the dispersion comprises:

dispersing the metal precursor in a dispersant, and

dispersing the graphene-precursor material in a dispersant

10. The process of claim 1, wherein the dispersion further comprises one or more water-soluble primary amine.

11. The process of claim 1, wherein the metal precursor is an aluminum precursor powder or a copper precursor powder, and optionally, one or more powders are chosen from nickel precursor powders, manganese precursor powders, zinc precursor powders, and combinations thereof.

12. The process of claim 1, wherein the metal precursor is present 95 to 99 wt.% (based on the total weight of metal powder or a metal precursor and graphene-precursor material) in the dispersion.

13. The process of claim 1, wherein the graphene-precursor material is present 1 to 5 wt.% (based on the total weight of metal powder or a metal precursor and graphene-precursor material) in the dispersion.

14. The process of claim 1, wherein the ratio of metal precursor weight to graphene-precursor material weight is 95:5 to 99: 1.

15. The process of claim 1, wherein the dispersant is water, a C1 to C6 alcohol, or a

combination thereof.

16. The process of claim 1, further comprising isolating the nanocomposite from the dispersion.

17. The process of claim 1, further comprising forming an ink comprising the nanocomposite.

18. The process of claim 17, further comprising forming a film using the ink.

19. The process of claim 18, wherein the film is formed by coating, printing, or additive manufacturing.

20. The process of claim 1, further comprising aligning the metal nanowires.

21. The process of claim 20, wherein the aligning comprises applying a shear force.

22. The process of claim 21, wherein the shear force is 3500 to 7000 kPa.

23. The process of claim 1, wherein the calcining is performed out at a temperature of 625 to 1110 K.

24. The process of claim 1, further comprising forming a pellet comprising the nanocomposite.

25. The process of claim 24, further comprising forming a wire from the pellet.

26. The process of claim 25, wherein the forming the wire comprises extruding the pellet.