CLAIMS

What is claimed is:

1. A wire for use in electron beam or plasma arc additive manufacturing, the wire comprising:

an outer tube portion comprising a first material, the first material at least comprising aluminum; and

a volume of particles contained within the outer tube portion, the volume of particles being a second material, wherein the second material is different than the first material and at least comprises titanium;

wherein the composition of the first material and second material are sufficient to produce a titanium alloy product when the wire is used in additive manufacturing.

2. The wire of claim 1, wherein the second material comprises an aluminum-containing titanium alloy.

3. The wire of claim 2, wherein the second material is a titanium alloy selected from the group consisting of Ti-6Al-4V, Ti-6Al-6V-2Sn, Ti-7Al-4Mo, Ti-6Al-2Sn-4Zr-6Mo, Ti-5Al-2Sn-2Zr-4Mo-4Cr, Ti-6Al-2Sn-2Zr-2Mo-2Cr, Ti-3Al-2.5V, Ti-10V-2Fe-3Al, Ti-13V-11Cr-3Al, Ti-8Mo-8V-2Fe-3Al, Ti-3Al-8V-6Cr-4Mo-4Zr, Ti-5Al-2.5Sn, Ti-8Al-1Mo-1V, Ti-6Al-2Sn-4Zr-2Mo, Ti-6Al-2Nb-1Ta-0.8Mo, Ti-2.25Al-11Sn-5Zr-1Mo, and Ti-5Al-5Sn-2Zr-2Mo.

4. The wire of any of claims 1-3, wherein the first material is a 1xxx aluminum alloy.

5. The wire of claim 4, wherein the first material comprises a sufficient amount of the aluminum and any secondary elements to achieve the target composition of the titanium alloy product.

6. The wire of claim 5, wherein the secondary elements comprise at least one of vanadium (V), tin (Sn), molybdenum (Mo), zirconium (Zr), niobium (Nb), chromium (Cr), iron (Fe) and combinations thereof.

7. The wire of claim 1, wherein the first material is essentially free of titanium.

8. The wire of claim 1, wherein the first material is a 1xxx aluminum alloy and wherein the second material is Ti-6Al-4V.

9. A wire for use in electron beam or plasma arc additive manufacturing, comprising:

(a) a first elongate outer tube;

(i) wherein the first elongate outer tube comprises a first material or a second material

(b) a second elongate inner tube disposed within the first elongate outer tube;

(i) wherein the second elongate inner tube comprise the other of the first material and the second material relative to the first elongate outer tube;

wherein the first material at least comprises aluminum;

wherein the second material is different than the first material and at least comprises titanium;

wherein the composition of the first material and second material are sufficient to produce a titanium alloy product when the wire is used in additive manufacturing.

10. The wire of claim 9, wherein the second material comprises an aluminum-containing titanium alloy.

11. The wire of claim 10, wherein the second material is a titanium alloy selected from the group consisting of Ti-6Al-4V, Ti-6Al-6V-2Sn, Ti-7Al-4Mo, Ti-6Al-2Sn-4Zr-6Mo, Ti-5Al-2Sn-2Zr-4Mo-4Cr, Ti-6Al-2Sn-2Zr-2Mo-2Cr, Ti-3Al-2.5V, Ti-10V-2Fe-3Al, Ti-13V-11Cr-3Al, Ti-8Mo-8V-2Fe-3Al, Ti-3Al-8V-6Cr-4Mo-4Zr, Ti-5Al-2.5Sn, Ti-8Al-1Mo-1V, Ti-6Al-2Sn-4Zr-2Mo, Ti-6Al-2Nb-1Ta-0.8Mo, Ti-2.25Al-11Sn-5Zr-1Mo, and Ti-5Al-5Sn-2Zr-2Mo.

12. The wire of any of claims 9-11, wherein the first material is a 1xxx aluminum alloy.

13. The wire of claim 12, wherein the first material comprises a sufficient amount of the aluminum and any secondary elements to achieve the target composition of the titanium alloy product.

14. The wire of claim 13, wherein the secondary elements comprise at least one of vanadium (V), tin (Sn), molybdenum (Mo), zirconium (Zr), niobium (Nb), chromium (Cr), iron (Fe) and combinations thereof.

15. The wire of claim 9, wherein the first material is essentially free of titanium.

16. The wire of claim 9, wherein the first material is a 1xxx aluminum alloy and wherein the second material is Ti-6Al-4V.

17. A wire for use in electron beam or plasma arc additive manufacturing, comprising:

(a) a first fiber;

(i) wherein the first fiber comprises a first material, the first material at least comprising aluminum;

(b) a second fiber intertwined with the first fiber;

(i) wherein the second fiber comprises a second material;

(ii) wherein the second material is different than the first material and at least comprises titanium;

wherein the composition of the first material and second material are sufficient to produce a titanium alloy product when the wire is used in additive manufacturing.

18. The wire of claim 17, wherein the second material comprises an aluminum-containing titanium alloy.

19. The wire of claim 18, wherein the second material is a titanium alloy selected from the group consisting of Ti-6Al-4V, Ti-6Al-6V-2Sn, Ti-7Al-4Mo, Ti-6Al-2Sn-4Zr-6Mo, Ti-5Al-2Sn-2Zr-4Mo-4Cr, Ti-6Al-2Sn-2Zr-2Mo-2Cr, Ti-3Al-2.5V, Ti-10V-2Fe-3Al, Ti-13V-11Cr-3Al, Ti-8Mo-8V-2Fe-3Al, Ti-3Al-8V-6Cr-4Mo-4Zr, Ti-5Al-2.5Sn, Ti-8Al-1Mo-1V, Ti-6Al-2Sn-4Zr-2Mo, Ti-6Al-2Nb-1Ta-0.8Mo, Ti-2.25Al-11Sn-5Zr-1Mo, and Ti-5Al-5Sn-2Zr-2Mo.

20. The wire of any of claims 17-19, wherein the first material is a 1xxx aluminum alloy.

21. The wire of claim 20, wherein the first material comprises a sufficient amount of the aluminum and any secondary elements to achieve the target composition of the titanium alloy product.

22. The wire of claim 21, wherein the secondary elements comprise at least one of vanadium (V), tin (Sn), molybdenum (Mo), zirconium (Zr), niobium (Nb), chromium (Cr), iron (Fe) and combinations thereof.

23. The wire of claim 17, wherein the first material is essentially free of titanium.

24. The wire of claim 17, wherein the first material is a 1xxx aluminum alloy and wherein the second material is Ti-6Al-4V.

25. A method of making a titanium alloy product, comprising:

(a) using a radiation source to heat a wire above the liquidus point of the titanium alloy body to be formed, thereby creating a molten pool;

(i) wherein the wire comprises a first portion and a second portion, wherein the first portion comprises a first material, and wherein the second portion comprises a second material;

(ii) wherein the first material comprises aluminum;

(iii) wherein the second material is different than the first material, wherein the second material comprises titanium;

(b) cooling the molten pool at a cooling rate of at least 1000ºC per second; and

(c) repeating steps (a)-(b) until the titanium alloy product is completed.