CLAIMS

1. A liquid precursor vaporizer comprising;

an inlet;

an outlet; and

a first vaporizer core, the first vaporizer core including a plurality of nested cells defining a plurality of tortuous paths through which a liquid precursor can pass in a path between the inlet and the outlet of the liquid precursor vaporizer, wherein at least one of the plurality of tortuous paths includes a series of alternating pinch and expanding regions.

2. The vaporizer of claim 1, further comprising a second vaporizer core in communication with the first vaporizer core, the first and second vaporizer cores defining the path for the liquid precursor between the inlet and the outlet of the liquid precursor vaporizer.

3. The vaporizer of claim 2, further comprising a sheath enclosing the first and second vaporizer cores.

4. The vaporizer of claim 3, wherein the sheath enclosing the first and second vaporizer cores includes an aluminum material.

5. The vaporizer of claim 4, wherein the aluminum material extends into a central volume of each of the first and second vaporizer cores.

6. The vaporizer of claim 1, wherein the first vaporizer core is manufactured by an additive manufacturing (AM) process.

7. The vaporizer of claim 6, wherein the AM process includes the use of laser fused Inconel 718 as an AM material.

8. The vaporizer of claim 6, wherein the AM process includes a post-annealing operation to remove porosity.

9. The vaporizer of claim 1, further comprising a heater.

10. The vaporizer of claim 4, further comprising at least one heater disposed between the first and second vaporizer cores.

11. A method for vaporizing a liquid precursor, the method comprising:

providing a liquid cursor vaporizer, the vaporizer including

an inlet and an outlet; and

a first vaporizer core, the first vaporizer core including a plurality of nested cells defining a plurality of tortuous paths through which a liquid precursor can pass in a path between the inlet and the outlet of the liquid precursor vaporizer;

causing the liquid precursor to pass through the plurality of tortuous paths in the path between the inlet and the outlet of the vaporizer, wherein at least one of the plurality of tortuous paths includes a series of alternating pinch and expanding regions.

12. The method of claim 11, wherein the liquid precursor vaporizer further comprises a second vaporizer core in communication with the first vaporizer core, the first and second vaporizer cores defining the path for the liquid precursor between the inlet and the outlet of the liquid precursor vaporizer.

13. The method of claim 12, wherein the liquid precursor vaporizer further comprises a sheath enclosing the first and second vaporizer cores.

14. The method of claim 13, wherein the sheath encloses the first and second vaporizer cores includes an aluminum material.

15. The method of claim 14, wherein the aluminum material extends into a central volume of each of the first and second vaporizer cores.

16. The method of claim 11, further comprising manufacturing the first vaporizer core using an additive manufacturing (AM) process.

17. The method of claim 16, wherein the AM process includes the use of laser fused Inconel 718 as an AM material.

18. The method of claim 16, wherein the AM process includes a post-annealing operation to remove porosity.

19. The method of claim 12, further comprising providing at least one heater between the first and second vaporizer cores.