CLAIMS:

WHAT IS CLAIMED IS:

1. A hydrocarbon pyrolysis furnace component composed of an erosion resistant alloy, the erosion resistant alloy comprising: a) 42.0 to 46.0 wt. % nickel (Ni); b) 32.1 to 35.2 wt. % chromium (Cr); c) 0.6 to 2.9 wt. % carbon I; d) 0 to 2.0 wt. % titanium (Ti); e) 0 to 4.0 wt. % tungsten (W); f) balance iron (Fe); and less than 1.0 wt. % silicon, wherein the erosion resistant alloy comprises 1.0 wt. % or more of at least one of Ti and W.

2. The hydrocarbon pyrolysis furnace component of claim 1, wherein the erosion resistant alloy comprises at least one strengthening mechanism, the at least one strengthening mechanism comprising:

(i) a carbides strengthening mechanism, wherein the erosion resistant alloy comprises carbides of at least one of titanium, tungsten, and chromium;

(ii) a gamma prime (γ') strengthening mechanism, wherein the erosion resistant alloy comprises Ni_3Ti;

(iii) a solid solution strengthening mechanism; or

(iv) a combination of two or more of (i), (ii), and (iii).

3. The hydrocarbon pyrolysis furnace component of claim 1 or 2, wherein the erosion resistant alloy is substantially free of aluminum.

4. The hydrocarbon pyrolysis furnace component of any one of claims 1 to 3, wherein the erosion resistant alloy comprises 14 wt. % or more of Fe.

5. The hydrocarbon pyrolysis furnace component of any one of claims 1 to 4, wherein the hydrocarbon pyrolysis furnace component comprises a feed conduit, a dilution steam conduit, a convection tube, a radiant tube, a radiant coil, a pipe, a transfer line exchanger, a quench zone conduit, or a combination thereof.

6. The hydrocarbon pyrolysis furnace component of any one of claims 1 to 5, wherein the hydrocarbon pyrolysis furnace component comprises a steam cracker furnace component.

7. The hydrocarbon pyrolysis furnace component of any one of claims 1 to 6, wherein the hydrocarbon pyrolysis furnace component comprises 1.0 wt. % to 2.9 wt. % carbon.

8. The hydrocarbon pyrolysis furnace component of any one of claims 1 to 7, wherein the hydrocarbon pyrolysis furnace component comprises a monolithic structure.

9. The hydrocarbon pyrolysis furnace component of any one of claims 1 to 8, wherein the hydrocarbon pyrolysis furnace component has substantially no content of silicon.

10. A method for producing a hydrocarbon pyrolysis furnace component, comprising:

forming the hydrocarbon pyrolysis furnace component comprising an erosion resistant alloy via hot-isostatic-pressing, sintering, centrifugal casting, static casting, extrusion, forging, rolling, joining, machining, or a combination thereof,

wherein the erosion resistant alloy comprises: a) 42.0 to 46.0 wt. % nickel (Ni); b) 32.1 to 35.2 wt. % chromium (Cr); c) 0.6 to 2.9 wt. % carbon (C); d) 0 to 2.0 wt. % titanium (Ti); e) 0 to 4.0 wt. % tungsten (W); f) balance iron (Fe); and less than 1.0 wt. % silicon, wherein the erosion resistant alloy comprises 1.0 wt. % or more of at least one of Ti and W.

11. The method of claim 10, wherein the erosion resistant alloy comprises at least one strengthening mechanism, the at least one strengthening mechanism comprising:

(i) a carbides strengthening mechanism, wherein the erosion resistant alloy comprises carbides of at least one of titanium, tungsten, and chromium;

(ii) a gamma prime (γ') strengthening mechanism, wherein the erosion resistant alloy comprises Ni_3Ti;

(iii) a solid solution strengthening mechanism; or

(iv) a combination of two or more of (i), (ii), and (iii).

12. The method of claim 10 or 11, wherein forming the hydrocarbon pyrolysis furnace component comprises:

forming a billet comprising the erosion resistant alloy; and

forming the hydrocarbon pyrolysis furnace component from the billet.

13. The method of any one of claims 10 to 12, wherein forming the hydrocarbon pyrolysis furnace component comprises forming the furnace component via hot-isostatic pressing.

14. The method of any one of claims 10 to 13, wherein the erosion resistant alloy is substantially free of aluminum.

15. The method of any one of claims 10 to 14, wherein the erosion resistant alloy comprises 14 wt. % or more of Fe.

16. The method of any one of claims 10 to 15, wherein the hydrocarbon pyrolysis furnace component comprises 1.0 wt. % to 2.9 wt. % carbon.

17. The method of any one of claims 10 to 16, wherein the hydrocarbon pyrolysis furnace component comprises a feed conduit, a dilution steam conduit, a convection tube, a radiant tube, a radiant coil, a pipe, a transfer line exchanger, a quench zone conduit, or a combination thereof.

18. The method of any one of claims 10 to 17, wherein the hydrocarbon pyrolysis furnace component comprises a monolithic structure.

19. The hydrocarbon pyrolysis furnace component of any one of claims 10 to 18, wherein the hydrocarbon pyrolysis furnace component has substantially no content of silicon.

20. A method for producing olefins, comprising pyrolyzing a hydrocarbon feed in a pyrolysis environment comprising a furnace component, the furnace component comprising an erosion resistant alloy,

wherein the erosion resistant alloy comprises: a) 42.0 to 46.0 wt. % nickel (Ni); b) 32.1 to 35.2 wt. % chromium (Cr); c) 0.6 to 2.9 wt. % carbon (C); d) 0 to 2.0 wt. % titanium (Ti); e) 0 to 4.0 wt. % tungsten (W); f) balance iron (Fe); and less than 1.0 wt. % silicon, wherein the erosion resistant alloy comprises 1.0 wt. % or more of at least one of Ti and W.

21. The method of claim 20, wherein the erosion resistant alloy comprises at least one strengthening mechanism, the at least one strengthening mechanism comprising:

(i) a carbides strengthening mechanism, wherein the erosion resistant alloy comprises carbides of at least one of titanium, tungsten, and chromium;

(ii) a gamma prime (γ') strengthening mechanism, wherein the erosion resistant alloy comprises Ni_3Ti;

(iii) a solid solution strengthening mechanism; or

(iv) a combination of two or more of (i), (ii), and (iii).

22. The method of claim 20 or 21, wherein the method of pyrolyzing a hydrocarbon feed comprises steam cracking, or wherein the pyrolysis environment comprises a steam cracking environment, or a combination thereof.

23. The method of any one of claims 20 to 22, wherein the erosion resistant alloy is substantially free of aluminum.

24. The method of any one of claims 20 to 23, wherein the erosion resistant alloy comprises 14 wt. % or more of Fe.

25. The method of any one of claims 20 to 24, wherein the furnace component comprises 1.0 wt. % to 2.9 wt. % carbon.

26. The method of any one of claims 20 to 25, wherein the furnace component comprises a feed conduit, a dilution steam conduit, a convection tube, a radiant tube, a radiant coil, a pipe, a transfer line exchanger, a quench zone conduit, or a combination thereof.

27. The method of any one of claims 20 to 26, wherein the furnace component comprises a monolithic structure.

28. The hydrocarbon pyrolysis furnace component of any one of claims 20 to 27, wherein the furnace component has substantially no content of silicon.