CLAIMS

1. A furnace coil for a steam cracker comprising one or more sections consisting of:

i) a continuous metal passageway, comprising a metal, permitting the flow of cracked gasses there through having a melting temperature greater than 1000°C adapted to co-operate with passes in the coil;

said metal having one or more areas comprising:

a) a porosity so that from 5 to 75% of the pores having a size from 0.001 to 0.05 microns; or

b) ceramic inserts in or over coating on said metal having a melting point greater than 900°C and a porosity so that from 5 to 75% of pores having a size from 0.001 microns to 0.5 microns;

said areas being over coated with a dense gas-selective membrane having a thickness from 0.1 to 10 microns permitting the diffusion of at least one of H_2, CH_4, CO and CO_2 at temperatures from 500°C to 900°C out of said passageway.

2. The furnace coil according to claim 1, wherein the metal or ceramic inserts or overcoating have a porosity so that from 10 to 50% of the pores have a size from 0.001 to 0.05 microns.

3. The furnace coil according to claim 2, wherein the ceramic inserts comprise a ceramic that is formed from oxides, dioxides, nitrides, carbides and phosphates selected from the group consisting of porous silicon dioxide, fused silicon dioxide, porous aluminum oxide, titanium dioxide, zirconium dioxide, thorium dioxide, lanthanum oxide, magnesium oxide, calcium oxide, barium oxide, tin oxide, cerium dioxide, zinc oxide, boron oxide, boron nitride, boron carbide, boron phosphate, zirconium phosphate, yttrium oxide, aluminum silicate, silicon nitride, silicon carbide and mixtures thereof.

4. The furnace coil according to claim 3, wherein said area over coated with the dense gas-selective membrane comprises one or more of iron, nickel, titanium, chromium, aluminum, and molybdenum.

5. The furnace coil according to claim 4, wherein the dense gas-selective membrane further comprises one or more metals selected from the group consisting of Pd, Ta, V, Pt, Nb and Zr.

6. The furnace coil according to claim 5, wherein the dense gas-selective membrane further comprises one or more metal oxide ceramic selected from the group consisting of Al_2O_3, $BaTiO_3$, $SrTiO_3$ and ZrO_2.

7. The furnace coil according to claim 6, wherein the dense gas-selective membrane is a dense metal oxide membrane.

8. The furnace coil according to claim 7, wherein in the dense gas-selective membrane comprises Pd.

9. The furnace coil according to claim 7, wherein the dense gas-selective membrane comprises yttria stabilized ZrO_2.

10. The furnace coil according to claim 7, wherein the dense gas-selective membrane comprises calcia stabilized ZrO_2.

11. The furnace coil according to claim 7, wherein the dense gas-selective membrane is not less than about 95% of theoretical density.

12. The furnace coil according to claim 3, wherein the ceramic is a Si/C/N ceramic formed by:

combining a monomeric and/or oligomeric silazane ceramic precursor with a comonomer comprising one or more of the group consisting of ene (vinyl) functionalized, oligomeric, inorganic or organic silazanes, difunctional thiols, and tetrafunctional thiols;

forming the combination as a thin film on a substrate;

photopolymerizing the thin film; and

pyrolyzing the photopolymerized thin film so as to result in a ceramic membrane that contains substantially no oxide.

13. The furnace coil according to claim 12, wherein said monomeric and/or oligomeric silazanes contain heteroatoms selected from the group consisting of boron, titanium, aluminum, phosphorus, and combinations thereof.

14. The furnace coil according to claim 1, wherein the continuous metal passage way is a tubular passage way forming part of the coil.

15. The furnace coil according to claim 1, wherein the continuous metal passage way is a 90° bend or a 180° bend forming part of the coil.

16. A method to remove one or more of H_2, CH_4, CO and CO_2 from cracked gasses in a furnace coil by incorporating one or more sections according to claim 1.

17. A cracking furnace comprising one or more coils according to claim 1.

18. A method for cracking a paraffin by passing it through a furnace coil according to claim 1, at a temperature from 850°C to 950°C.

19. The method according to claim 18, wherein said paraffin is a C_{2-4} paraffin.

20. The method according to claim 19, wherein the paraffin is ethane.