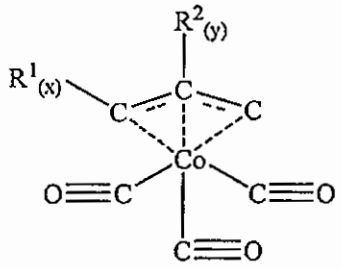
Claims:

1. A method for forming a cobalt-containing thin film by a vapor deposition process, the method comprising using at least one precursor corresponding in structure to Formula I:



(Formula I),

wherein

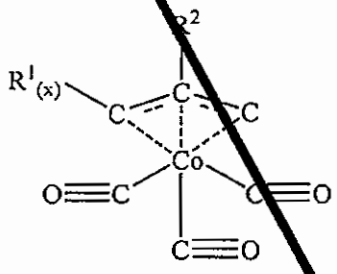
R^1 and R^2 are independently C_2-C_8-alkyl;

x is zero, 1 or 2; and

y is zero or 1;

wherein both x and y cannot be zero simultaneously.

2. The method of Claim 1, wherein the at least one precursor corresponds in structure to Formula Ia:



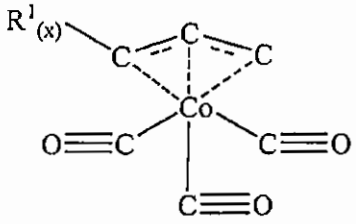
(Formula Ia),

wherein

R^1 and R^2 are independently C_2-C_8-alkyl; and

x is zero, 1 or 2.

3. The method of Claim 1, wherein the at least one precursor corresponds in structure to Formula Ib:



(Formula Ib),

wherein

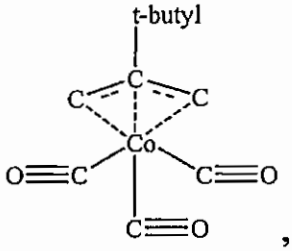
R^1 is independently C_2-C_8-alkyl; and

x is 1 or 2.

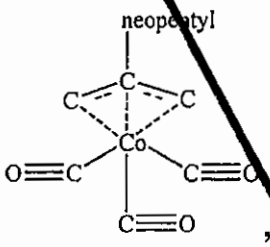
4. The method of Claim 1, wherein y is 1 and x is 1.

5. The method of Claim 1, wherein y is 1 and x is 2.

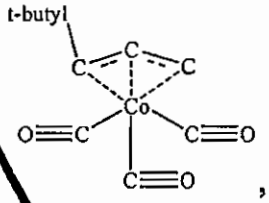
6. The method of Claim 1, wherein the at least one precursor is selected from the group consisting of:



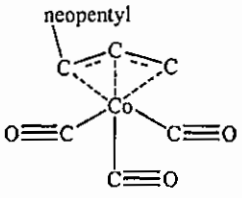
,



,



, and



.

7. The method of Claim 1, wherein the vapor deposition process is chemical vapor deposition.

8. The method of Claim 7, wherein the chemical vapor deposition is liquid injection chemical vapor deposition.

9. The method of Claim 1, wherein the vapor deposition process is atomic layer deposition.

10. The method of Claim 9, wherein the atomic layer deposition is liquid injection atomic layer deposition or pulsed injection atomic layer deposition.

11. The method of Claim 1, wherein the at least one precursor is delivered to a substrate in pulses alternating with pulses of an oxygen source selected from the group consisting of H_2O, O_2 and ozone to form a metal oxide film.

12. The method of Claim 11, further comprising using at least one co-precursor having a metal selected from the group consisting of Ta, Si, Fe, Ru, Ni, Mn, Rh, W and Ir to form a mixed-metal oxide film.

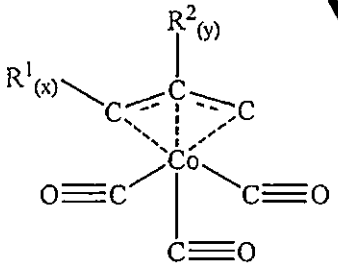
13. The method of Claim 12, wherein the mixed-metal oxide film comprises cobalt and silicon.

14. The method of Claim 1, further comprising using at least one appropriate co-reactant selected from the group consisting of hydrogen, hydrogen plasma, oxygen, air, water, ammonia, a hydrazine, an alkyl-substituted hydrazine, a borane, a silane, ozone and a combination thereof.

15. The method of Claim 9, further comprising using an alkyl-substituted hydrazine as a co-reactant to form a cobalt-containing thin film.

16. The method of Claim 1, wherein the thin film formed comprises a cobalt-nitride or a cobalt-silicon thin film.

17. An organometallic precursor corresponding in structure to Formula I:



(Formula I),

wherein

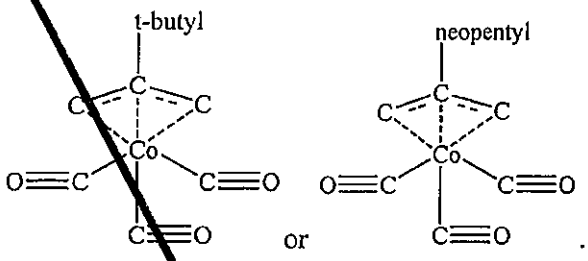
R^1 is C_1-C_8-alkyl;

R^2 is C_3-C_8-alkyl;

x is zero, 1 or 2; and

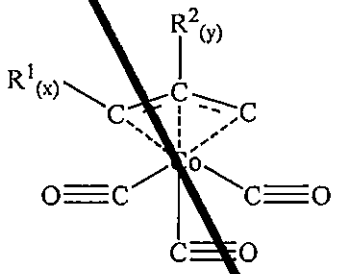
y is 1.

18. The precursor of Claim 17, wherein the precursor is



or

19. An organometallic precursor corresponding in structure to Formula I:



(Formula I),

wherein

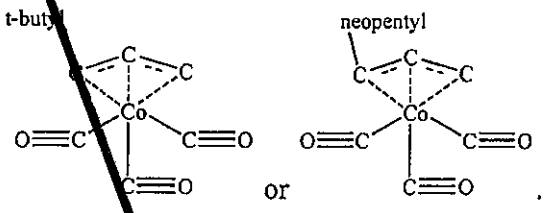
R^1 is C_3-C_8-alkyl;

R^2 is C_1-C_8-alkyl;

x is 1 or 2; and

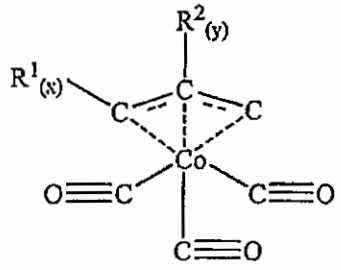
y is zero or 1.

20. The precursor of Claim 19, wherein the precursor is


t-butyl
neopentyl
Co
Co
or

Claims:

1. A method for forming a cobalt-containing thin film by a vapor deposition process, the method comprising using at least one precursor corresponding in structure to Formula I:



(Formula I),

wherein

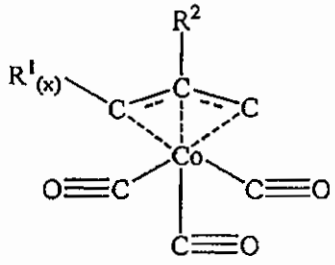
R^1 and R^2 are independently C_2-C_8-alkyl;

x is zero, 1 or 2; and

y is zero or 1;

wherein both x and y cannot be zero simultaneously.

2. The method of Claim 1, wherein the at least one precursor corresponds in structure to Formula Ia:



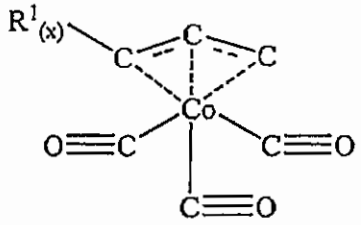
(Formula Ia),

wherein

R^1 and R^2 are independently C_2-C_8-alkyl; and

x is zero, 1 or 2.

3. The method of Claim 1, wherein the at least one precursor corresponds in structure to Formula Ib:



(Formula Ib),

wherein

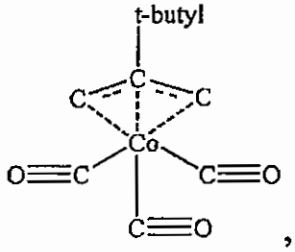
R^1 is independently C_2-C_8-alkyl; and

x is 1 or 2.

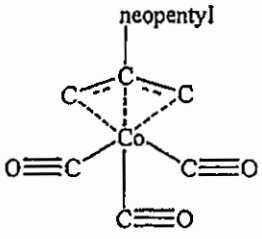
4. The method of Claim 1, wherein y is 1 and x is 1.

5. The method of Claim 1, wherein y is 1 and x is 2.

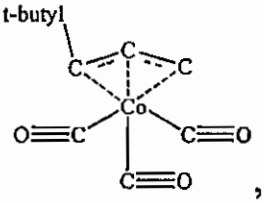
6. The method of Claim 1, wherein the at least one precursor is selected from the group consisting of:



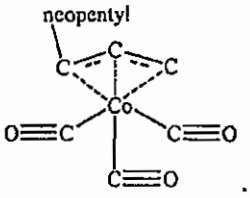
,



,



, and



.

7. The method of Claim 1, wherein the vapor deposition process is chemical vapor deposition.

8. The method of Claim 7, wherein the chemical vapor deposition is liquid injection chemical vapor deposition.

9. The method of Claim 1, wherein the vapor deposition process is atomic layer deposition.

10. The method of Claim 9, wherein the atomic layer deposition is liquid injection atomic layer deposition or pulsed injection atomic layer deposition.

11. The method of Claim 1, wherein the at least one precursor is delivered to a substrate in pulses alternating with pulses of an oxygen source selected from the group consisting of H_2O, O_2 and ozone to form a metal oxide film.

12. The method of Claim 11, further comprising using at least one co-precursor having a metal selected from the group consisting of Ta, Si, Fe, Ru, Ni, Mn, Rh, W and Ir to form a mixed-metal oxide film.

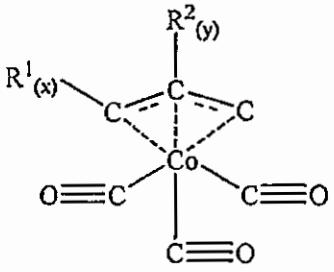
13. The method of Claim 12, wherein the mixed-metal oxide film comprises cobalt and silicon.

14. The method of Claim 1, further comprising using at least one appropriate co-reactant selected from the group consisting of hydrogen, hydrogen plasma, oxygen, air, water, ammonia, a hydrazine, an alkyl-substituted hydrazine, a borane, a silane, ozone and a combination thereof.

15. The method of Claim 9, further comprising using an alkyl-substituted hydrazine as a co-reactant to form a cobalt-containing thin film.

16. The method of Claim 1, wherein the thin film formed comprises a cobalt-nitride or a cobalt-silicon thin film.

17. An organometallic precursor corresponding in structure to Formula I:



(Formula I),

wherein

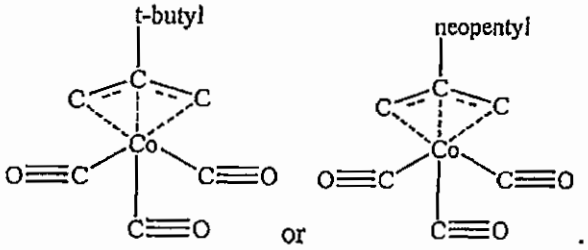
R^1 is C_1-C_8-alkyl;

R^2 is C_3-C_8-alkyl;

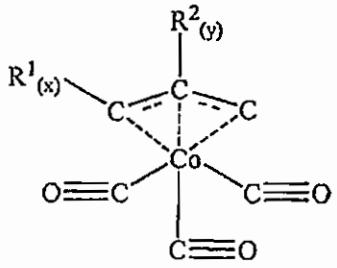
x is zero, 1 or 2; and

y is 1.

18. The precursor of Claim 17, wherein the precursor is



19. An organometallic precursor corresponding in structure to Formula I:



(Formula I),

wherein

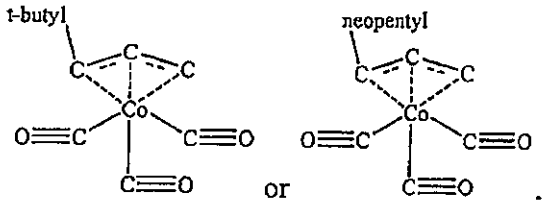
R^1 is C_3-C_8-alkyl;

R^2 is C_1-C_8-alkyl;

x is 1 or 2; and

y is zero or 1.

20. The precursor of Claim 19, wherein the precursor is


t-butyl
neopentyl
Co
Co
or