We claim:

1. A process for forming an integrated circuit interconnect structure, said process comprising:

a) providing a partially-completed and planarized interconnect structure comprising an electrically insulating surface and an electrically conductive, copper-containing surface;

b) depositing a protecting agent that comprises two or more compounds over said electrically insulating surface to synergistically reduce affinity of said electrically insulating surface to a precursor comprising manganese, cobalt, chromium or vanadium;

c) selectively depositing a metal selected from the group consisting of manganese, cobalt, chromium and vanadium on at least a part of the electrically conductive copper-containing surface.

2. The process as in claim 1, wherein said selectively depositing a metal is carried out by CVD or ALD.

3. The process as in claim 1, wherein said protecting agent reduces reactivity of said insulating surface with said precursor comprising manganese.

4. The process as in claim 1, wherein said protecting agent reduces reactivity of said insulating surface with said precursor comprising cobalt.

5. The process as in claim 1, wherein said protecting agent reduces reactivity of said insulating surface with said precursor comprising chromium.

6. The process as in claim 1, wherein said protecting agent reduces reactivity of said insulating surface with said precursor comprising vanadium.

7. The process as in claim 1, wherein said protecting agent is selectively deposited on said electrically insulating surface.

8. The process as in claim 7, wherein said protecting agent comprises two or more alkylsilanes.

9. The process as in claim 8, wherein the alkylsilanes comprise compounds with one or more dialkylamide groups bonded to silicon.

10. The process as in claim 9, wherein the compounds with one or more dialkylamide groups bonded to silicon comprise bis(*N,N*-dialkylamino)dialkylsilanes and (*N,N*-dialkylamino)trialkylsilanes.

11. A process for forming an integrated circuit interconnect structure, said process comprising:

a) providing a partially-completed interconnect structure having one or more vias and trenches, said vias and trenches comprising sidewalls defined by one or more electrically insulating materials and electrically conductive copper-containing bottom regions;

b) depositing a layer comprising a nitride of a metal selected from the group consisting of manganese, chromium and vanadium on the partially-completed interconnect structure;

c) depositing copper within said one or more vias and trenches.

12. The process of claim 11, further comprising removing nitrogen from said layer comprising metal nitride prior to said depositing copper within said one or more vias and trenches.

13. The process as in claim 12 wherein said removing nitrogen is accomplished by contact of the structure with a hydrogen-containing plasma.

14. The process as in claim 11 wherein said depositing copper comprises electroplating or electroless plating from a liquid solution.

15. The process as in claim 11 wherein said depositing copper comprises deposition from the vapor phase by CVD or ALD.

16. The process as in claim 11, wherein said layer comprising a nitride of a metal comprises manganese nitride.

17. A process comprising:

depositing a metal containing layer from a vapor of a metal containing precursor, wherein the metal is selected from the group consisting of manganese, chromium and vanadium;

depositing an iodine or bromine containing material from a vapor of an iodine or bromine containing precursor, wherein the iodine or bromine containing material is chemisorbed on or in the metal containing layer; and

depositing a copper containing material from a vapor of a copper containing precursor, wherein the iodine or bromine containing material allows a catalytic deposition of copper containing material.

18. The process of claim 17, wherein said depositing an iodine or bromine containing material is carried out after said depositing a metal containing layer.

19. The process of claim 17, wherein the iodine or bromine containing material is chemisorbed on the surface of the metal containing layer.

20. The process of claim 17, wherein the metal containing layer is a manganese containing layer and the metal containing precursor is a manganese containing precursor.

21. The process of claim 20, wherein the manganese containing layer further contains nitrogen.

22. The process of claim 17, wherein the metal containing layer is a chromium containing layer and the metal containing precursor is a chromium containing precursor.

23. The process of claim 17, wherein the metal containing layer is vanadium containing layer and the metal containing precursor is a vanadium containing precursor.

24. The process of claim 17, further comprising:

depositing additional iodine or bromine containing material from a vapor of an iodine or bromine containing precursor onto said copper containing material; and

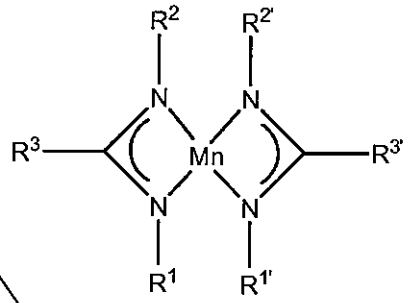
depositing additional copper containing material from a vapor of a copper containing precursor, wherein the additional iodine or bromine containing material allows a catalytic deposition of additional copper containing material.

25. The process of claim 24, wherein the additional copper containing material comprises copper and manganese.

26. The process of claim 24, wherein the additional copper containing material is co-deposited from a vapor of a manganese containing precursor.

27. The process of claim 20, wherein the manganese containing precursor comprises manganese amidinate.

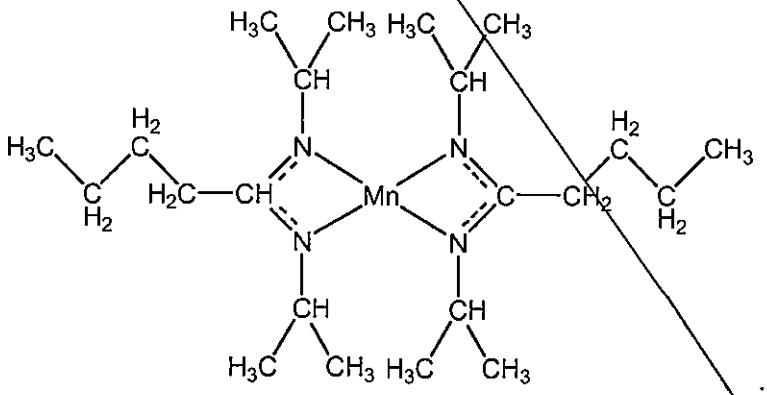
28. The process of claim 27, wherein the manganese amidinate has the general structure



in which R^1, R^2, R^3, $R^{1'}$, $R^{2'}$ and $R^{3'}$ are selected from the group consisting of hydrogen, hydrocarbon groups, substituted hydrocarbon groups, and other groups of non-metallic atoms.

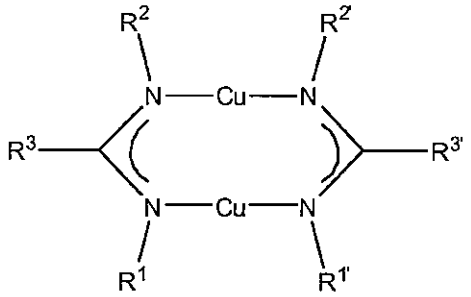
29. The process of claim 28 wherein R^1, R^2, R^3, $R^{1'}$, $R^{2'}$ and $R^{3'}$ are independently selected from the group consisting of hydrogen, alkyl, aryl, alkenyl, alkynyl, trialkylsilyl, alkylamide and fluoroalkyl groups.

30. The process of claim 29, wherein the manganese amidinate has the structure



31. The process of claim 17, wherein the copper containing precursor comprises copper amidinate.

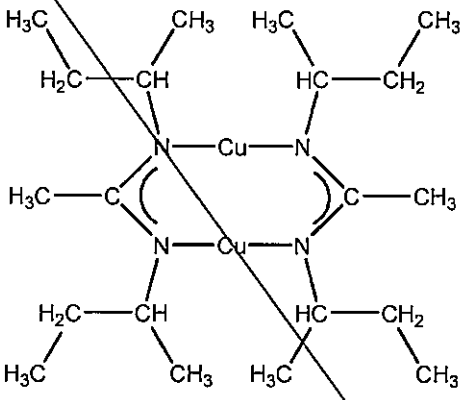
32. The process of claim 31, wherein the copper amidinate has the general structure



in which R^1, R^2, R^3, $R^{1'}$, $R^{2'}$ and $R^{3'}$ are selected from the group consisting of hydrogen, hydrocarbon groups, substituted hydrocarbon groups, and other groups of non-metallic atoms.

33. The process of claim 32, wherein R^1, R^2, R^3, $R^{1'}$, $R^{2'}$ and $R^{3'}$ are independently selected from the group consisting of hydrogen, alkyl, aryl, alkenyl, alkynyl, trialkylsilyl, alkylamide and fluoroalkyl groups.

34. The process of claim 33, wherein the copper amidinate has the structure



35. The process of claim 17, wherein the copper is deposited on a partially-completed interconnect structure having one or more vias and trenches, said vias and trenches comprising sidewalls defined by one or more electrically insulating materials and electrically conductive copper-containing bottom regions.

36. The process of claim 35, wherein the deposited copper substantially fills said vias and trenches.

37. The process of claim 17, wherein the deposited copper has a manganese concentration in the range of about 0.1% to about 4%.

38. The process of claim 17, wherein the deposited copper has a manganese concentration in the range of about 0.2% to about 2%.

39. The process of claim 17, further comprising removing the iodine or bromine from at least a part of the surface of the copper-containing material.

40. The process of claim 39, wherein said removing the iodine or bromine includes an oxidation process.

41. The process of claim 40, wherein said oxidation process includes exposing the at least a part of the surface of the copper-containing material with an oxidant selected from the group consisting of hydrogen peroxide, sodium hypochlorite, sodium hypobromite, ozone, an oxygen plasma, and mixtures thereof.

42. The process of claim 40, wherein said removing the iodine or bromine further includes a reduction process.

43. The process of claim 42, wherein the reduction step includes a hydrogen plasma.

44. The process as in claim 39, further comprising modifying said at least a part of the surface of the copper-containing material after said removing the iodine or bromine to decrease deposition of copper. .

45. The process of claim 44, wherein said modifying includes reaction of the copper surface with an alkanethiol.

We claim:

1. A process for forming an integrated circuit interconnect structure, said process comprising:

a) providing a partially-completed and planarized interconnect structure comprising an electrically insulating surface and an electrically conductive, copper-containing surface;
b) depositing a protecting agent that comprises two or more compounds, each compound having one or more dialkylamide groups bonded to silicon, over said
electrically insulating surface to synergistically reduce affinity of said electrically insulating surface to a precursor comprising manganese, cobalt, chromium or vanadium;
c) selectively depositing a metal selected from the group consisting of manganese,
cobalt, chromium and vanadium on at least a part of the electrically conductive copper-containing surface.

2. The process as in claim 1, wherein said selectively depositing a metal is carried out by CVD or ALD.

3. The process as in claim 1, wherein said protecting agent reduces reactivity of said insulating surface with said precursor comprising manganese.

4. The process as in claim 1, wherein said protecting agent reduces reactivity of said insulating surface with said precursor comprising cobalt.

5. The process as in claim 1, wherein said protecting agent reduces reactivity of said insulating surface with said precursor comprising chromium.

6. The process as in claim 1, wherein said protecting agent reduces reactivity of said insulating surface with said precursor comprising vanadium.

7. The process as in claim 1, wherein said protecting agent is selectively deposited on said electrically insulating surface.

8. The process as in claim 1 wherein the compounds having one or more dialkylamide groups bonded to silicon comprise bis(*N,N*-dialkylamino)dialkylsilanes and (*N,N*-dialkylamino) trialkylsilanes.