CLAIMS

1. A method of filling a feature formed on a surface of a substrate, comprising:

forming a continuous metal layer on the feature formed on the surface of the substrate, wherein a process of forming the continuous metal layer comprises:

(a) forming an amorphous silicon layer on exposed surfaces of the feature;

(b) converting the formed amorphous silicon layer to a metal thin film, wherein the process of converting the amorphous silicon layer comprises exposing the amorphous silicon layer to a metal containing precursor until substantially all of the silicon atoms in the amorphous silicon layer are replaced by one or more metal atoms found in the metal containing precursor, wherein the metal containing precursor includes tungsten, tantalum, molybdenum, or titanium; and

(c) repeating (a) and (b) at least twice, until a continuous thin film containing the metal atoms is formed on the surface of the feature, and wherein the process is performed at a pressure between about 5 Torr and about 20 Torr; and

forming a bulk metal layer over the formed continuous thin film.

2. The method of claim 1, wherein the substrate temperature during the process is maintained at a temperature between about 250 degrees Celsius and about 500 degrees Celsius.

3. The method of claim 1, wherein the process occurs at an RF power range between about 50 W and about 500 W.

4. The method of claim 1, wherein the metal thin film is made of tungsten.

5. The method of claim 1, wherein the substrate is made of materials consisting essentially of silicon nitride, silicon oxide, or aluminum oxide.

6. The method of claim 1, wherein the bulk metal has a resistivity of less than or equal to about 20 μΩ-cm.

7. A method for forming a thin film on a surface of a substrate, comprising:

forming a continuous metal layer on a feature formed on the surface of the substrate, wherein a process of forming the continuous metal layer comprises:

(a) forming an amorphous silicon layer on exposed surfaces of the feature;

(b) converting the formed amorphous silicon layer to a metal thin film, wherein the process of converting the amorphous silicon layer comprises exposing the amorphous silicon layer to a metal containing precursor until substantially all of the silicon atoms in the amorphous silicon layer are replaced by one or more metal atoms found in the metal containing precursor, wherein the metal containing precursor includes tungsten, tantalum, molybdenum, or titanium; and

(c) repeating (a) and (b) at least twice, until a continuous thin film containing the metal atoms is formed on the surface of the feature and the thin film is between about 10 angstroms and about 100 angstroms; and

filling the feature formed on the surface of the substrate by forming a bulk metal layer over the formed continuous thin film.

8. The method of claim 7, wherein the process is performed at a pressure between about 5 Torr and about 20 Torr.

9 The method of claim 7, wherein the substrate temperature during the process is maintained at a temperature between about 250 degrees Celsius and about 500 degrees Celsius.

10. The method of claim 7, wherein the process occurs at an RF power range between about 50 W and about 500 W.

11. The method of claim 7, wherein the metal thin film is made of tungsten.

12. The method of claim 7, wherein the substrate is made of materials consisting essentially of silicon nitride, silicon oxide, or aluminum oxide.

13. The method of claim 7, wherein the bulk metal has a resistivity of less than or equal to about 20 μΩ-cm.

14. A method for forming a thin film, comprising:

forming a continuous metal layer on a feature formed on a surface of a substrate, wherein a process of forming the continuous metal layer comprises:

(a) forming an amorphous silicon layer on exposed surfaces of the feature, wherein the amorphous silicon layer is between about 10 angstroms and about 40 angstroms;

(b) converting the formed amorphous silicon layer to a metal thin film, wherein the process of converting the amorphous silicon layer comprises exposing the amorphous silicon layer to a metal containing precursor until substantially all of the silicon atoms in the amorphous silicon layer are replaced by one or more metal atoms found in the metal containing precursor,

wherein the metal containing precursor includes tungsten; and

(c) repeating (a) and (b) at least twice, until a continuous thin film containing the metal atoms is formed on the surface of the feature and the thin film has a thickness of between about 10 angstroms and about 100 angstroms; and

filling the feature formed on the surface of the substrate by forming a bulk metal layer over the formed continuous thin film.

15. The method of claim 14, wherein the process is performed at a pressure between about 5 Torr and about 20 Torr.

16. The method of claim 14, wherein the substrate temperature during the process is maintained at a temperature between about 250 degrees Celsius and about 500 degrees Celsius.

17. The method of claim 14, wherein the process occurs at an RF power range between about 50 W and about 500 W.

18. The method of claim 14, wherein the metal thin film is made of tungsten.

19. The method of claim 14, wherein the bulk metal has a resistivity of less than or equal to about 20 μΩ-cm.