CLAIMS

1. A method of forming a semiconductor structure, the method comprising:

cleaning a substrate to form a substrate surface substantially free of oxide, the substrate including at least one feature having a bottom surface and a sidewall surface, the bottom surface comprising silicon germanium (SiGe), and the sidewall surface comprising a dielectric material;

exposing the substrate surface to a first molybdenum precursor;

exposing the substrate surface to a reactant to selectively deposit a first molybdenum film on the bottom surface; and

forming a cap layer on the first molybdenum film or treating the first molybdenum film to form the cap layer, the cap layer comprising a metal nitride, a PVD metal, or combinations thereof,

the method performed in a processing chamber without breaking vacuum.

2. The method of claim 1, wherein the substrate surface is exposed to the molybdenum precursor and the reactant sequentially or simultaneously.

3. The method of claim 1, wherein the reactant comprises one or more of an oxidizing agent and a reducing agent.

4. The method of claim 1, wherein the reactant comprises hydrogen (H_2), ammonia (NH_3), silane, polysilane, or combinations thereof.

5. The method of claim 1, wherein the first molybdenum precursor comprises molybdenum and a halide.

6. The method of claim 2, wherein exposing the substrate surface to the reactant reduces etching of the substrate surface by the first molybdenum precursor.

7. The method of claim 1, wherein the first molybdenum film has a thickness in a range of from 15 Å to 50 Å.

8. The method of claim 1, further comprising annealing the substrate.

9. The method of claim 8, wherein annealing forms a smooth substrate surface, the smooth surface comprises a root mean square (RMS) roughness in a range of from 4% to less than 30%.

10. The method of claim 1, wherein the at least one feature has an aspect ratio in a range of from 3:1 to 15:1.

11. The method of claim 10, further comprising filling the at least one feature with a second molybdenum film by exposing the at least one feature to a second molybdenum precursor and a second reactant.

12. The method of claim 11, further comprising depositing a liner in the at least one feature before filling the at least one feature with the second molybdenum film.

13. The method of claim 12, wherein the liner comprises a metal nitride or a PVD metal.

14. The method of claim 13, wherein exposing the substrate surface to the second molybdenum precursor reduces an overhang formed by the liner in the at least one feature.

15. A method of forming a semiconductor structure without breaking a vacuum, the method comprising:

cleaning a substrate to form a substrate surface substantially free of oxide, the substrate surface comprising at least one feature having a bottom surface and a sidewall surface, the bottom surface comprising silicon germanium (SiGe), and the sidewall surface comprising a dielectric material;

performing a first operation on the substrate surface, the first operation comprising exposing the substrate surface to a first molybdenum precursor and exposing the substrate surface to a reactant to selectively deposit a first molybdenum film on the bottom surface;

treating the bottom surface to form or deposit one or more of a cap and a liner; and

annealing the substrate.

16. A method of forming a semiconductor structure, the method comprising:

performing the method of claim 15;

performing a second deposition operation on the substrate surface, the second deposition process comprising exposing the substrate surface to a second molybdenum precursor and exposing the substrate surface to a second reactant to deposit a second molybdenum film on the substrate surface.