

What is claimed is:

1. A substrate processing method comprising:
5 providing a substrate with at least one substrate surface comprising a first material comprising a metal; and
 oxidizing the first material to form an expanded first material, oxidizing the first material comprises exposing the first material to an oxidizing agent at a pressure greater than or equal to about 2 bar.
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2. The method of claim 1, wherein the first material consists essentially of W.
3. The method of claim 1, wherein oxidizing the first material is performed at a temperature less than or equal to about 425 °C.
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4. The method of claim 3, wherein first material consists essentially of W and oxidizing the first material is performed at a pressure in a range of about 2 bar to about 15 bar.
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5. A substrate processing method comprising:
 providing a substrate with at least one substrate surface comprising a first material comprising tungsten; and
 oxidizing the first material to expand the first material straight up from the substrate to form an expanded first material, oxidizing the first material
25 comprises exposing the first material to an oxidizing agent comprising one or more of H₂O, O₂, N₂O, O₃, CO₂, CO, or H₂O₂, at a pressure greater than or equal to about 2 bar.
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6. The method of claim 5, wherein the oxidizing agent consists essentially of H₂O.
7. The method of claim 5, wherein oxidizing the first material is performed at a temperature less than or equal to about 425 °C.

8. The method of claim 5, wherein oxidizing the first material is performed by a thermal process without plasma.
- 5 9. The method of claim 5, wherein oxidizing the first material is performed at a pressure greater than or equal to about 10 bar.
10. A method of substrate processing comprising:
- 10 providing a substrate with a substrate surface with at least one feature formed therein, the at least one feature extending a distance into the substrate from the substrate surface and having a sidewall and bottom;
- forming a tungsten-containing film on the substrate surface and in the at least one feature;
- 15 removing the tungsten-containing film from the substrate surface outside of the at least one feature; and
- oxidizing the tungsten-containing film to form a tungsten oxide pillar which extends from the at least one feature, oxidizing the tungsten-containing film comprises exposing the substrate to an oxidizing agent comprising one or more of H_2O , O_2 , N_2O , O_3 , CO_2 , CO , or H_2O_2 , at a pressure greater than or equal to about 2 bar.
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11. The method of claim 10, wherein the tungsten-containing film comprises a tungsten sub-oxide having an average tungsten oxidation state in a range of greater than 0 to less than +6.
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12. The method of claim 10, wherein the tungsten-containing film is removed so that a top of the tungsten-containing film is about coplanar with the substrate surface outside the feature.
- 30 13. The method of claim 10, wherein the oxidizing agent consists essentially of H_2O .

14. The method of claim 10, wherein the tungsten oxide pillar comprises WO_3 .
15. The method of claim 10, wherein the tungsten oxide pillar comprises a tungsten sub-oxide having an average tungsten oxidation state in a range of greater than
5 0 to less than +6.