CLAIMS

1. A method of cleaning a chamber surface to remove tin oxide therefrom, the method comprising:

exposing the chamber surface to a first plasma generated from a first plasma generation gas comprising a first reducing chemistry to reduce the tin oxide to tin; and

exposing the chamber surface to a second plasma generated from a second plasma generation gas comprising a second reducing chemistry and organic additive chemistry to remove the tin from the chamber surface.

2. The method of claim 1, wherein the first plasma generation gas further comprises an inert gas.

3. The method of claim 2, wherein the inert gas comprises at least one gas selected from the group consisting of helium, neon, argon, xenon, and nitrogen (N_2).

4. The method of claim 1, wherein a ratio of reducing chemistry:organic additive chemistry in the second plasma generation gas is about 0.01 to about 100.

5. The method of claim 1, wherein at least one of the first reducing chemistry or the second reducing chemistry comprises at least one species selected from the group consisting of elemental hydrogen (H_2), ammonia (NH_3), diborane (B_2H_6), sulfur dioxide (SO_2), hydrazine (N_2H_4), diisobutylaluminum hydride ($(i\text{-}Bu_2AlH)_2$), formic acid (HCOOH), carbon monoxide (CO), a sulfite, an iodide, a phosphite, a hypophosphite, and a cyanide.

6. The method of claim 1, wherein the organic additive chemistry comprises at least one species selected from the group consisting of an alkane, an alcohol, a carboxylic acid, and an acetate.

7. The method of claim 5, wherein the first plasma generation gas is substantially free of CH_4.

8. The method of claim 5, wherein the first plasma generation gas is substantially free of carbon-containing species.

9. The method of any of claims 1-8, wherein the first plasma and the second plasma are each capacitively coupled plasmas.

10. An apparatus for processing a substrate, the apparatus comprising:
a processing chamber having a chamber surface on an interior of the processing chamber;
an inlet to the processing chamber for introducing reactants to the processing chamber;
an outlet to the processing chamber for removing species from the processing chamber;
a plasma generator configured to provide plasma in the processing chamber; and
a controller configured to cause:
exposing the chamber surface to a first plasma generated from a first plasma generation gas comprising a first reducing chemistry to reduce tin oxide on the chamber surface to tin, and
exposing the chamber surface to a second plasma generated from a second plasma generation gas comprising a second reducing chemistry and an organic additive chemistry to remove the tin from the chamber surface.

11. The apparatus of claim 10, wherein the plasma generator is a capacitively coupled plasma generator.

12. The apparatus of claim 10, further comprising a first gas source comprising the first reducing chemistry and a second gas source comprising the second reducing chemistry, wherein at least one of the first reducing chemistry or the second reducing chemistry comprises at least one species selected from the group consisting of elemental hydrogen (H_2), ammonia (NH_3), diborane (B_2H_6), sulfur dioxide (SO_2), hydrazine (N_2H_4), diisobutylaluminum hydride ((i-$Bu_2AlH)_2$), formic acid (HCOOH), carbon monoxide (CO), a sulfite, an iodide, a phosphite, a hypophosphite, and a cyanide.

13. The apparatus of claim 10, wherein the organic additive chemistry comprises at least one species selected from the group consisting of an alkane, an alcohol, a carboxylic acid, and an acetate.

14. The apparatus of claim 13, wherein the organic additive chemistry comprises a species having between 1-6 carbon atoms.

15. The apparatus of claim 13, wherein the organic additive chemistry comprises the alkane.

16. The apparatus of claim 13, wherein the organic additive chemistry comprises the alcohol.

17. The apparatus of claim 13, wherein the organic additive chemistry comprises the carboxylic acid.

18. The apparatus of claim 13, wherein the controller further comprises instructions cause the first plasma generation gas to be substantially free of carbon-containing species.

19. The apparatus of claim 18, wherein the controller further comprises instructions cause the first plasma generation gas to be introduced with an inert gas.

20. The apparatus of any of claims 10-19, wherein the controller further comprises instructions cause a ratio of reducing chemistry:organic additive chemistry in the second plasma generation gas to be between about 0.5 and 20.