CLAIMS

~~What is claimed is:~~

1. A method for reducing contamination in an etch chamber, comprising:

placing a substrate with a metal containing layer in the etch chamber;

etching the metal containing layer, producing nonvolatile metal residue deposits on surfaces of the etch chamber, wherein some of the metal residue of the metal residue is in a first state;

removing the substrate from the etch chamber; and

conditioning the chamber by converting metal residue in the first state to metal residue in a second state, where metal residue in the second state has stronger adhesion to surfaces of the etch chamber than metal residue in the first state~~.~~,

~~2. The method, as recited in claims 1,~~ wherein the metal residue in the first state is at least one of metal nitrides or metal hydrides and wherein metal residue in the second state is a native state metal.

~~3.~~2. The method, as recited in ~~2~~1, wherein the conditioning the chamber, comprises:

providing an oxidation to convert the at least one of metal nitrides or metal hydrides to a metal oxide; and

providing a reduction to convert the metal oxide to native state metal.

~~4.~~3. The method, as recited in claim ~~3~~2, wherein the providing a reduction is at least one of providing a hydrogen reduction, reduction by heating, or reduction by irradiation.

~~5.~~4. The method, as recited in claim 43, wherein the etching the metal, comprises:

providing a chemical reaction of the metal in the metal containing layer; and

sputtering the chemically reacted metal in the metal containing layer.

~~6.~~5. The method, as recited in claim ~~5~~4, wherein the conditioning the chamber is performed waferless.

~~7.~~6. The method, as recited in claim ~~6~~5, wherein the native state metal is either an elemental metal or an alloy of at least two elemental metals.

~~8.~~7. The method, as recited in claim ~~7~~6, wherein the chamber has a power window and a Faraday shield, which reduces residue deposited on the power window.

~~9.~~8. The method, as recited in claim ~~8~~7, wherein the Faraday shield is grounded so that more residue is deposited on the Faraday shield than on the power window, and wherein the conditioning the chamber converts metal residue deposited on the Faraday shield to native state metal.

~~10.~~9. The method, as recited in claim 1, wherein the etching the metal, comprises:

providing a chemical reaction of the metal in the metal containing layer; and

sputtering the chemically reacted metal in the metal containing layer.

~~11.~~10. The method, as recited in claim 1, wherein the conditioning the chamber is performed waferless.

~~12.~~11. The method, as recited in claim 1, wherein the chamber has a power window and a Faraday shield, which reduces residue deposited on the power window.

~~13.~~12. A method for reducing contamination in an etch chamber, comprising:

placing a substrate with a metal containing layer in the etch chamber;

etching the metal containing layer, producing nonvolatile metal residue deposits on surfaces of the etch chamber, wherein some of the metal residue of the metal residue is in a first state;

removing the substrate from the etch chamber; and

conditioning the chamber by converting metal residue in the first state to metal residue in a second state, where metal residue in the second state has stronger adhesion to surfaces of the etch chamber than metal residue in the first state,

wherein the chamber has a power window and a Faraday shield, which reduces residue deposited on the power window,

~~The method, as recited in claim 12,~~

wherein the Faraday shield is grounded so that more residue is deposited on the Faraday shield than on the power window, and wherein the conditioning the chamber converts metal residue deposited on the Faraday shield to native state metal.

~~14.~~13. ~~The~~ A method for reducing contamination in an etch chamber, comprising:

placing a substrate with a metal containing layer in the etch chamber;

etching the metal containing layer, producing nonvolatile metal residue deposits on surfaces of the etch chamber, wherein some of the metal residue of the metal residue is in a first state;

removing the substrate from the etch chamber; and

conditioning the chamber by converting metal residue in the first state to metal residue in a second state, where metal residue in the second state has stronger adhesion to surfaces of the etch chamber than metal residue in the first state, wherein the conditioning the chamber ~~as recited in 1, wherein the conditioning the chamber,~~ comprises:

providing an oxidation to convert the metal residue to a metal oxide; and

providing a reduction to convert the metal oxide to native state metal.

~~15.~~14. The method, as recited in claim ~~14~~13, wherein the native state metal is either an

elemental metal or an alloy of at least two elemental metals.

~~16.~~15. The method, as recited in claim ~~15~~14, wherein the providing a reduction is at least one of providing a hydrogen reduction, reduction by heating, or reduction by irradiation.

~~17.~~16. A method for reducing contamination in an etch chamber with a power window and a Faraday shield adjacent to the power window, comprising:

placing a substrate with a metal containing layer in the etch chamber;

etching the metal containing layer, producing nonvolatile metal residue deposits on surfaces of the etch chamber including the Faraday shield, wherein the metal residue comprises a metal hydride or metal nitride, wherein the etching comprises:

providing a chemical reaction of the metal in the metal containing layer; and

sputtering the chemically reacted metal in the metal containing layer;

removing the substrate from the etch chamber; and

conditioning the chamber by converting metal residue which comprises the metal hydride or a metal nitride to a native state metal, where native state metal has stronger adhesion to surfaces of the etch chamber than the metal hydride or metal nitride, comprising:

providing an oxidation to convert the metal nitride or metal hydride to a metal oxide; and

providing a reduction to convert the metal oxide to native state metal.

~~18.~~17. The method, as recited in claim ~~17~~16, wherein the providing a reduction is at least one of providing a hydrogen reduction, reduction by heating, or reduction by irradiation.

~~19.~~18. The method, as recited in claim ~~18~~17, wherein the conditioning the chamber is performed waferless.