

CLAIMS

What is claimed is:

- 1) An organometallic compound of Formula I:



wherein:

Q is OR^1 or Cp;

each R^1 group is independently selected from the group consisting of an alkyl or aryl group having from 1 to 10 carbon atoms;

each $R^{1'}$ group is independently selected from the group consisting of an alkyl, acyl or aryl group having from 1 to 10 carbon atoms;

x is an integer from 1 to 4;

A^1 is O when x is 0 and A^1 is N when x is an integer from 1 to 3; and

z is 1 when A^1 is O and z is 2 when A^1 is N.

- 2) The organometallic compound according to claim 1, wherein x is an integer from 1 to 3.

- 3) The organometallic compound according to any one of claims 1 or 2, wherein Q is OR^1 .

- 4) The organometallic compound according to any one of claims 1 or 2, wherein Q is Cp.

- 5) The organometallic compound according to claim 4, wherein x is 1.

- 6) The organometallic compound according to any one of claims 1-5, wherein each $R^{1'}$ group is independently selected from the group consisting of an alkyl group having from 1 to 4 carbon atoms.

- 7) The organometallic compound according to any one of claims 1-6, wherein each $R^{1'}$ group is Me.
- 8) The organometallic compound according to any one of claims 1-7, wherein, when z is 2, each $R^{1'}$ represents a combination of two different alkyl, acyl, or aryl groups.
- 9) The organometallic compound according to claim 1, wherein x is 4.
- 10) The organometallic compound according to any one of claims 1-3 or 6-9, wherein each R^1 group is independently selected from the group consisting of an alkyl group having 1 to 4 carbon atoms.
- 11) The organometallic compound according to any one of claims 1-3 or 6-10, wherein at least one R^1 group is Me.
- 12) The organometallic compound according to claim 1, wherein the organometallic compound is selected from the group consisting of $(MeO)_2Sn(NMe_2)_2$, $(MeO)_2Sn(NEtMe)_2$, $(MeO)_3Sn(NMe_2)$, $(MeO)_3Sn(NEtMe)$, $Sn(OMe)_4$, $CpSn(NMeEt)_3$, and $CpSn(NMe_2)_3$.
- 13) An organometallic compound of Formula II:
- $$Sn(NR^2(CH_2)_nA^2)_2 \quad \text{Formula II}$$
- wherein:
- each A^2 is independently selected from $NR^{2'}$ or O;
- each R^2 group is independently selected from the group consisting of hydrogen and an alkyl or aryl group having from 1 to 10 carbon atoms;
- each $R^{2'}$ group is independently selected from the group consisting of

hydrogen and an alkyl, acyl or aryl group having from 1 to 10 carbon atoms;

n is 2 or 3;

optionally $\text{NR}^2(\text{CH}_2)_n\text{NR}^{2'}$ forms a cyclic structure; and

optionally at least one of the (CH_2) has one or more substitutions with an alkyl group having from 1 to 10 carbon atoms.

14) The organometallic compound of claim 13, wherein each A^2 is O and Formula II is represented by Formula IIa: $\text{Sn}(\text{NR}^2(\text{CH}_2)_n\text{O})_2$.

15) The organometallic compound of claim 14, wherein each R^2 group is independently selected from the group consisting of an alkyl group having 1 to 4 carbon atoms.

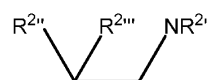
16) The organometallic compound of claim 13, wherein at least one of the CH_2 has one or more substitutions with an alkyl group having from 1 to 10 carbon atoms.

17) The organometallic compound of claim 16, wherein only one of the CH_2 in each amine has one or more substitutions with an alkyl group having from 1 to 10 carbon atoms.

18) The organometallic compound of claim 17, wherein the one of the CH_2 in each amine has two substitutions with methyl or ethyl.

19) The organometallic compound of any one of claims 13 or 16-18, wherein each

A^2 is N and Formula II is represented by Formula IIb: $\text{Sn}(\text{R}^2\text{N}-\text{CH}_2-\text{CH}(\text{R}^{2''})-\text{CH}(\text{R}^{2'''})-\text{CH}_2-\text{NR}^{2'})_2$,
 wherein each $\text{R}^{2''}$ group and each $\text{R}^{2'''}$ group is an independently selected alkyl group having 1 to 10 carbon atoms.



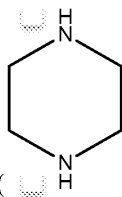
20) The organometallic compound of claim 19, wherein each $R^{2''}$ group and each $R^{2'''}$ group is methyl or ethyl.

21) The organometallic compound of any one of claims 16-20, wherein each R^2 group and each $R^{2'}$ group is independently selected from the group consisting of an alkyl group having 1 to 4 carbon atoms.

22) The organometallic compound of any one of claims 16-20, wherein each R^2 group and each $R^{2'}$ group is hydrogen.

23) The organometallic compound of claim 13, wherein each $NR^2(CH_2)_nNR^{2'}$ forms a cyclic structure.

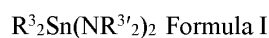
24) The organometallic compound of claim 23, wherein Formula II is represented



by Formula IIc: $Sn(\text{piperazine})_2$.

25) The organometallic compound of claim 13, wherein each $(NR^2(CH_2)_nA^2)$ is selected from the group consisting of N,N'-dimethylethylenediamine ($NMe(CH_2)_2NMe$), piperazine ($N_2C_4H_8$), N,N'-diethylethylenediamine ($NEt(CH_2)_2NEt$), N,N'-diisopropylethylenediamine ($NiPr(CH_2)_2NiPr$), N,N'-di-tert-butylethylenediamine ($NtBu(CH_2)_2NtBu$), N,N'-dimethyl-1,3-propanediamine ($NMe(CH_2)_3NMe$), 2,2-dimethyl-1,3-propanediamine ($NH(CH_2)(C(CH_3)_2)(CH_2)NH$), 2-(methyamino)ethanol ($NMe(CH_2)_2O$), and 2-(ethylamino)ethanol ($NEt(CH_2)_2O$).

26) A composition comprising:
a first organometallic compound represented by Formula I:



wherein:

each R^3 group is independently selected from the group consisting of an alkyl or aryl group having from 1 to 10 carbon atoms;

each $R^{3'}$ group is independently selected from the group consisting of an alkyl or aryl group having from 1 to 10 carbon atoms; and

a second organometallic compound represented by Formula II:



wherein each R^4 group is independently selected from the group consisting of an alkyl or aryl group having from 1 to 10 carbon atoms.

27) The composition according to claim 26, wherein the $R^{3'}$ group and the R^4 group are the same.

28) The composition according to claim 26 or 27, wherein each R^3 group is independently selected from the group consisting of an alkyl group having 1 to 4 carbon atoms.

29) The composition according to any one of claims 26-28, wherein each $R^{3'}$ group and each R^4 group is independently selected from the group consisting of an alkyl group having 1 to 4 carbon atoms.

30) The composition according to any one of claims 26-29, wherein the second organometallic compound is selected from the group consisting of $Sn(NMe_2)_4$, $Sn(NEt_2)_4$, and $Sn(NMeEt)_4$.

31) A process for removing tin oxide deposits from interior surfaces of a reactor chamber or from a substrate within said reactor chamber, comprising:

introducing an etchant gas into said reactor chamber comprising tin oxide deposits, said etchant gas being of the general formula $A^3O_mX_n$, wherein:

A^3 is selected from the group consisting of C, N, and S,

O is oxygen,

each X is independently selected from a group consisting of halogens, and

the subscripts m and n are greater than zero;

activating said etchant gas either before or after said introduction;

allowing an etching reaction to proceed between said activated etchant gas and said tin oxide deposits; and

evacuating the etchant gas together with gaseous products of the etching reaction.

32) A process for removing deposits from interior surfaces of a reactor chamber or from a substrate within said reactor chamber, comprising:

introducing an etchant gas and additive into said reactor chamber, said etchant gas being of the general formula $A^3O_mX_n$, wherein:

A^3 is selected from the group consisting of N and S,

O is oxygen,

each X is independently selected from a group consisting of halogens,

the subscripts m and n are greater than zero, and

said additive being of the general formula $C_xH_yO_z$, wherein the subscripts x and z are greater than zero;

activating said etchant gas either before or after said introduction;

allowing an etching reaction to proceed between said activated etchant gas and said deposits; and

evacuating the etchant gas together with gaseous products of the etching reaction.

33) The process according to claim 31 or 32, wherein X represents a combination of two different halogens.

34) The process according to any one of claims 31-33, further comprising generating said etchant gas prior to said introduction into said chamber.

35) The process according to any one of claims 31-34, further comprising bubbling a carrier gas through a liquid chemical constituent to volatilize said liquid chemical constituent into said etchant, prior to said introduction of said etchant gas into said chamber.

36) The process according to claim 35, wherein said etchant gas is generated by bubbling a carrier gas through a plurality of liquid chemical constituents and then combining the resulting gases.

37) The process according to claim 35, wherein said etchant gas is generated by mixing two or more chemical constituent gases.

38) The process according to any one of claims 31-37, wherein said etchant gas is activated by exposing it to an activation mechanism in a gas activation chamber prior to introduction into said chamber; said gas activation mechanism being selected from the group consisting of heat, ultraviolet light and plasma discharge.

39) The process according to any one of claims 31-38, wherein said etchant gas is activated by exposing it to a thermal activation mechanism after introduction into said chamber; said thermal activation mechanism being selected from the group consisting

of: the overall temperature within said chamber and a local heat source within said chamber.

40) The process according to any one of claims 31-39, wherein said etchant gas is thionyl chloride (SOCl_2).

41) The process according to any one of claims 32-40, wherein said additive is CO or CO_2 .

42) The process according to any one of claims 31-41, wherein a halogen containing additive is added to a gaseous mixture with said etchant gas.

43) The process according to claim 42, wherein the halogen containing additive is an active halogen or a compound of the general formula RY , wherein R is selected from the group consisting of H and Me; and Y is a halogen selected from the group consisting of F, Cl, Br, and I.

44) The process according to claim 43, wherein the active halogen includes Cl or Br.

45) The process according to any one of claims 31-44, wherein a dilution additive is added to a gaseous mixture with said etchant gas.

46) The process according to claim 45, wherein the dilution additive includes N, Ar, He, or Ne.

47) The process according to any one of claims 31-46, further comprising heating said reactor chamber to a temperature of at least 100°C , preferably between 100°C and 900°C , more preferably between 100°C and 400°C .

48) The process according to any one of claims 31-47, further comprising providing said reactor chamber with a pressure of between 0.1 mBar and 1500 mBar, preferably between 0.1 mBar and 1000 mBar.