process.

39. The article of manufacture of any one of SENTENCEs 33-37, wherein the article of manufacture is designed for, and configured to operate in, an etching gas environment in which a surface of the article both comprises the chemically reactive material and is to be exposed to an etching gas that is capable of chemically reacting with the chemically reactive material.
40. The article of manufacture of SENTENCE 39, wherein the etching gas environment is an etching process in a semiconductor manufacturing process.
41. The article of manufacture of SENTENCE 40, wherein the article of manufacture is a shower head designed and configured for introducing an etching gas into the etching process within an enclosure or chamber.
42. The article of manufacture of SENTENCE 40, wherein the enclosure or chamber is an etching chamber and the semiconductor manufacturing process is a dry etching process utilizing a fluorocarbon etching gas.
43. The article of manufacture of SENTENCE 42, wherein the article of manufacture is a shower head designed and configured for introducing an etching gas into the etching process within an enclosure or chamber.
44. The article of manufacture of SENTENCE 43, wherein the enclosure or chamber is a batch etching chamber and the semiconductor manufacturing process is a dry etching process utilizing a fluorocarbon etching gas.
45. The article of manufacture of any one of SENTENCEs 39-44, wherein the etching gas environment is a NF_3 remote plasma.
46. The article of manufacture of any one of SENTENCEs 33-45, wherein the surface of the chemically reactive material comprises structural features having an aspect ratio of 6.25:1 or greater, such as 10:1 or 20:1.
47. A method of delivering an etching gas to an etching process, comprising the step of:
    a. introducing the etching gas into the etching process via an article of manufacture according to any one of SENTENCEs 33-46.

In one aspect, there is provided a chemical of the formula: $M(FAB)_3 \bullet D_Y$, wherein M is a rare earth element, preferably selected from Yttrium, La, Ce, Sm, Tb, Yb, wherein FAB is a Fluorinated Anionic Bidentate selected from the group consisting of hexafluoroacetylacetone (hfac), trifluoroacetylacetonate (tfac), 2,2-dimethyl-6,6,7,7,8,8,8-heptafluoro-3,5-octanedione (fod), and combinations thereof, more preferably hfac, and wherein D is a neutral ligand with y = 1 to 4, preferably y = 1 or 2 and each D is independently selected from the group consisting of 1-(2-Methoxyethoxy)propane and Ethylene glycol ethyl methyl ether.

In another aspect, the present disclosure provides a chemical composition comprising a chemical described herein.

In yet another aspect, the present disclosure provides method of depositing a conformal and adherent MOF or MF_3 thin film on a surface of a chemically reactive material that forms all or part of an article of manufacture, the method comprising the steps of

a. first exposing the surface to a vapor of a metal containing chemical composition described herein,

b. second exposing the surface to an oxidant gas, preferably ozone, and

c. repeating steps a. and b., preferably sequentially a. then b., to form a desired thickness of the conformal and adherent MOF or MF_3 film on the surface.

BRIEF DESCRIPTION OF THE DRAWINGS

So that the manner in which the above recited features of the present disclosure can be understood in detail, a more particular description of the various aspects, briefly summarized above, may be had by reference to example embodiments, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments of this disclosure and are therefore not to be considered limiting of its scope, for the disclosure may admit to other equally effective embodiments.

CLAIMS:

1. A chemical of the formula:

$$M(FAB)_3 \bullet D_Y$$

wherein M is a rare earth element, preferably selected from Yttrium, La, Ce, Sm, Tb, Yb,

wherein FAB is a Fluorinated Anionic Bidentate selected from the group consisting of hexafluoroacetylacetone (hfac), trifluoroacetylacetonate (tfac), 2,2-dimethyl-6,6,7,7,8,8,8-heptafluoro-3,5-octanedione (fod), and combinations thereof, more preferably hfac, and

wherein D is a neutral ligand with y = 1 to 4, preferably y = 1 or 2 and each D is independently selected from the group consisting of 1-(2-Methoxyethoxy)propane and Ethylene glycol ethyl methyl ether.

2. The chemical of claim 1, wherein M is Yttrium.
3. The chemical of any one of claims 1 or 2, wherein y = 1 or 2.
4. The chemical of any one of claims 1 or 2, wherein the chemical is a liquid at 1 atmosphere pressure and 50 degrees C or less, preferably liquid at 25 degrees C or less, more preferably liquid at 20 degrees C or less.
5. The chemical of claim 1 or 2 selected to be Yttrium(III) hexafluoroacetylacetonate 1-(2-Methoxyethoxy)propane.
6. The chemical of claim 1 or 2 selected to be Yttrium(III) hexafluoroacetylacetonate Ethylene glycol ethyl methyl ether.
7. A chemical composition comprising a chemical according to any one of claims 1-6.
8. A method of depositing a conformal and adherent MOF or MF_3 thin film on a surface of a chemically reactive material that forms all or part of an article of manufacture, the method comprising the steps of:
    a. first exposing the surface to a vapor of a metal containing chemical composition according to claim 7,
    b. second exposing the surface to an oxidant gas, preferably ozone, and
    c. repeating steps a. and b., preferably sequentially a. then b., to form a desired thickness of the conformal and adherent MOF or MF_3 film on the surface.
9. The method of claim 8, wherein a temperature during step a. and/or step b. is from 200 degrees C to 350 degrees C, preferable from 250 degrees C to 300 degrees C, more preferably from 250 degrees C to 275 degrees C.
10. The method of claim 8 or 9, wherein the conformal and adherent MOF or MF_3 film comprises an atomic percentage of less than 15% for oxygen, preferably less than 10% oxygen, more preferably less than 5% for oxygen, and less than 3% for carbon,

preferably less than 1.5% for carbon.

11. The method of any one of claims 8 or 9, wherein a film growth per cycle of deposition is 0.11 angstroms or greater, preferably 0.14 angstroms or greater, more preferably 0.24 angstroms or greater, such as 0.24 to 0.30 angstroms.
12. The method of any one of claims 8 or 9, wherein the final MOF or MF_3 film is 20% to 100% conformal by scanning electron microscopy measurements, preferably 50% to 100%, more preferably 80% to 100%, such as 95% to 100%.