

WHAT IS CLAIMED IS:

1. A process for depositing a conducting metal into a trench or hole, wherein the trench or hole is surrounded by a dielectric film, the process comprising:
 - a) providing a dielectric film;
 - 5 b) depositing on top of the dielectric film a resist layer selected from the group consisting of a refractory metal resist layer and a silicon containing resist layer;
 - c) patterning the resist layer to form a pattern having a trench or hole using actinic radiation or an electron beam or x-ray;
 - d) transferring the pattern created in the resist layer to the underlying
10 dielectric film by etching; and
 - e) filling the created pattern in the dielectric film with a conducting metal to form a dielectric film having a conducting metal filled trench or a conducting metal filled hole.
- 15 2. The process of claim 1, wherein the resist layer is a refractory metal resist layer.
3. The process of claim 1, wherein the resist layer is a silicon containing resist layer.
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4. The process of claims 1, wherein the trench or hole has a dimension of at most about 10 microns.
5. The process of claims 1, wherein the trench or hole has a dimension of at
25 most about 2 microns.
6. The process of claims 1, further comprising forming a multi-stacked structure comprising the dielectric film having a conducting metal filled trench or a conducting metal filled hole.
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7. The process of claims 1, wherein the dielectric film has a dielectric loss of at most about 0.004.

8. The process of claims 1, wherein the resist layer is patterned in the light wavelength range of from about 13 nm to about 436 nm.

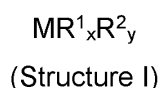
9. The process of claims 1, wherein the process does not remove the resist layer.

10. The process of claims 1, wherein the dielectric film comprises at least one polymer having a dielectric constant of at most about 4 and a dielectric loss of at most about 0.004.

11. The process of claim 2, wherein the refractory metal resist layer is prepared from a composition comprising:

- a) at least one a metal-containing (meth)acrylate compound;
- b) at least one solvent; and
- c) at least one initiator.

12. The process of claim 11, wherein the at least one metal-containing (meth)acrylate compound has Structure I:



wherein

- each R^1 is independently a (meth)acrylate-containing organic group;
- each R^2 is independently selected from the group consisting of alkoxide, thiolate, alkyl, aryl, carboxy, β -diketonate, cyclopentadienyl and oxo;
- x is 1, 2, 3, or 4, y is 0, 1, 2, or 3, and $x + y = 4$; and
- M is Ti, Zr or Hf.

13. The process of claim 11, wherein the at least one metal-containing (meth)acrylate comprises titanium tetra(meth)acrylate, zirconium tetra(meth)acrylate, hafnium tetra(meth)acrylate, titanium butoxide tri(meth)acrylate, titanium dibutoxide di(meth)acrylate, titanium tributoxide (meth)acrylate, zirconium butoxide tri(meth)acrylate, zirconium dibutoxide di(meth)acrylate, zirconium tributoxide (meth)acrylate, hafnium butoxide tri(meth)acrylate, hafnium dibutoxide di(meth)acrylate, hafnium tributoxide (meth)acrylate, titanium tetra(carboxyethyl (meth)acrylate), zirconium tetra(carboxyethyl (meth)acrylate), hafnium tetra(carboxyethyl (meth)acrylate), titanium butoxide tri(carboxyethyl (meth)acrylate), titanium dibutoxide di(carboxyethyl (meth)acrylate), titanium tributoxide (carboxyethyl (meth)acrylate), zirconium butoxide tri(carboxyethyl (meth)acrylate), zirconium dibutoxide di(carboxyethyl (meth)acrylate), zirconium tributoxide (carboxyethyl (meth)acrylate), hafnium butoxide tri(carboxyethyl (meth)acrylate), hafnium dibutoxide di(carboxyethyl (meth)acrylate), or hafnium tributoxide (carboxyethyl (meth)acrylate).

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14. The process of claim 3, wherein the silicon containing layer is prepared from a composition comprising:

- a) at least one silicon containing polymer;
- b) at least one solvent; and
- c) at least one photoacid generator.

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15. The process of claim 1, wherein the resist layer is patterned by contact printing, stepper, scanner, laser direct imaging, or laser ablation.

16. The process of claim 1, wherein the dielectric film is prepared from a dielectric composition comprising at least one dielectric polymer, the dielectric polymer is selected from the group consisting of polyimides, polyimide precursor polymers, polybenzoxazoles, polybenzoxazole precursor polymers, polyamideimides, (meth)acrylate polymers, epoxy polymers, polyurethanes, polyamides, polyesters, polyethers, novolac resins, polycycloolefins, polyisoprene, polyphenols, polyolefins,

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benzocyclobutene resins, diamondoids, polystyrenes, polycarbonates, cyanate ester resins, polysiloxanes, copolymers and mixtures thereof.

17. A process for depositing a conducting metal into a trench or hole, wherein
5 the trench or hole is surrounded by a dielectric film, the process comprising:

- a) providing a dry film comprising a carrier substrate, a resist layer selected from the group consisting of a refractory metal resist (RMR) layer and a silicon containing resist layer, and a dielectric film, wherein the resist layer is between the carrier substrate and the dielectric film;
- 10 b) laminating the dry film onto a semiconductor substrate such that the dielectric film is between the semiconductor substrate and the resist layer;
- c) removing the carrier substrate;
- d) patterning the resist layer to form a pattern having a trench or hole using actinic radiation or an electron beam or x-ray;
- 15 e) transferring the pattern created in the resist layer to the underlying dielectric film by etching; and
- f) filling the created pattern in the dielectric film with a conducting metal to form a dielectric film having a conducting metal filled trench or a conducting metal filled hole.

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18. The process of claim 17, wherein the resist layer is a refractory metal resist layer.

19. The process of claim 17, wherein the resist layer is a silicon containing
25 resist layer.

20. The process of claims 17, wherein the trench or hole has a dimension of at most about 10 microns.

21. The process of claims 17, wherein the trench or hole has a dimension of
30 at most about 2 microns.

22. The process of claims 17, further comprising forming a multi-stacked structure comprising the dielectric film having a conducting metal filled trench or a conducting metal filled hole.

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23. The process of claims 17, wherein the dielectric film has a dielectric loss of at most about 0.004.

24. The process of claims 17, wherein the resist layer is patterned in the light wavelength range of from about 13 nm to about 436 nm.

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25. The process of claims 17, wherein the process does not remove the resist layer.

26. The process of claims 17, wherein the dielectric film comprises at least one polymer having a dielectric constant of at most about 4 and a dielectric loss of at most about 0.004.

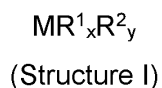
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27. The process of claim 18, wherein the refractory metal resist layer is prepared from a composition comprising:

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- a) at least one a metal-containing (meth)acrylate compound;
- b) at least one solvent; and
- c) at least one initiator.

28. The process of claim 27, wherein the at least one metal-containing (meth)acrylate compound has Structure I:



wherein

each R^1 is independently a (meth)acrylate-containing organic group;

each R² is independently selected from the group consisting of alkoxide, thiolate, alkyl, aryl, carboxy, β -diketonate, cyclopentadienyl and oxo;

x is 1, 2, 3, or 4, y is 0, 1, 2, or 3, and x + y = 4; and

M is Ti, Zr or Hf.

29. The process of claim 27, wherein the at least one metal-containing (meth)acrylate comprises titanium tetra(meth)acrylate, zirconium tetra(meth)acrylate, hafnium tetra(meth)acrylate, titanium butoxide tri(meth)acrylate, titanium dibutoxide di(meth)acrylate, titanium tributoxide (meth)acrylate, zirconium butoxide tri(meth)acrylate, zirconium dibutoxide di(meth)acrylate, zirconium tributoxide (meth)acrylate, hafnium butoxide tri(meth)acrylate, hafnium dibutoxide di(meth)acrylate, hafnium tributoxide (meth)acrylate, titanium tetra(carboxyethyl (meth)acrylate), zirconium tetra(carboxyethyl (meth)acrylate), hafnium tetra(carboxyethyl (meth)acrylate), titanium butoxide tri(carboxyethyl (meth)acrylate), titanium dibutoxide di(carboxyethyl (meth)acrylate), titanium tributoxide (carboxyethyl (meth)acrylate), zirconium butoxide tri(carboxyethyl (meth)acrylate), zirconium dibutoxide di(carboxyethyl (meth)acrylate), zirconium tributoxide (carboxyethyl (meth)acrylate), hafnium butoxide tri(carboxyethyl (meth)acrylate), hafnium dibutoxide di(carboxyethyl (meth)acrylate), or hafnium tributoxide (carboxyethyl (meth)acrylate).

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30. The process of claim 19, wherein the silicon containing layer is prepared from a composition comprising:

- a) at least one silicon containing polymer;
- b) at least one solvent; and
- c) at least one photoacid generator.

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31. The process of claim 17, wherein the resist layer is patterned by contact printing, stepper, scanner, laser direct imaging, or laser ablation.

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32. The process of claim 17, wherein the dielectric film is prepared from a dielectric composition comprising at least one dielectric polymer, the dielectric polymer

is selected from the group consisting of polyimides, polyimide precursor polymers, polybenzoxazoles, polybenzoxazole precursor polymers, polyamideimides, (meth)acrylate polymers, epoxy polymers, polyurethanes, polyamides, polyesters, polyethers, novolac resins, polycycloolefins, polyisoprene, polyphenols, polyolefins, benzocyclobutene resins, diamondoids, polystyrenes, polycarbonates, cyanate ester resins, polysiloxanes, copolymers and mixtures thereof.