CLAIMS

What is claimed is:

1. A photonics device, comprising:

a photonics dielectric stack on a substrate, the photonics dielectric stack including a dielectric layer and one or more photonics devices having a photosensitive material formation;

a first dielectric material layer with a first portion thereof formed over the photosensitive material formation, and a second portion thereof formed over the dielectric layer of the dielectric stack;

an etch stop layer over the first layer of dielectric material; and

a second dielectric material layer over the etch stop layer, the second dielectric material layer including an etched trench over the photosensitive material formation wherein a bottom of the trench is delimited by the photosensitive material formation.

2. The device of claim 1, wherein the etched trench is formed by plasmaless etching.

3. The device of claim 1, wherein the photosensitive material formation is germanium.

4. The device of claim 1, wherein the etch stop layer is patterned such that a light signal propagating within the photonics device is coupled to the etch stop layer.

5 The device of claim 1, further including an aluminum deposit within the trench having a planarized top surface thereof such that that top surface is defined by, at least, the dielectric stack and the aluminum deposit.

6. The device of claim 5, further including a metallization layer formation over the aluminum deposit and in electrical communication therewith.

7. The device of claim 6, further including a termination metallization layer formation at an elevation higher than an elevation of the metallization layer formation, the

termination metallization layer formation in electrical communication with the metallization layer.

8. A photonics device, comprising:

a photonics dielectric stack on a substrate and including a dielectric layer, the photonics dielectric stack including one or more photonics devices having a photosensitive material formation;

a first dielectric material layer with a first portion thereof formed over the photosensitive material formation, and a second portion thereof formed over the dielectric layer of the dielectric stack;

an etch stop layer over the first layer of dielectric material;

a second dielectric material layer on the etch stop layer, the second dielectric material layer including an etched trench over the photosensitive material formation such that a bottom of the trench is delimited by the photosensitive material formation, the trench further including an upper region of wider diameter and a lower region of narrower diameter, the trench further including an aluminum deposit including a top surface thereof that is atomically smooth and planar, the top surface defined by a dielectric layer of the photonics dielectric stack and the aluminum.

9. The device of claim 8, wherein the photonics device further having a bottom elevation thereof that is higher than an elevation of the planar top surface of the aluminum deposit.

10. The device of claim 9, further including:

one or more dielectric layers over the planar top surface;

a layer of waveguiding material over the one or more dielectric layers such that the layer of waveguiding material patterns defines the photonics device.

11. The device of claim 10, wherein the waveguiding material is patterned to define a waveguide formed by a range of elevations between the upper region and lower region of the trench.

12. The device of claim 8, further including a barrier layer comprised of a copper metallization layer, and wherein the trench is formed from etching through the barrier layer.

13. A photonics device, comprising:

a first photonics device formed by a first waveguiding layer comprised of a waveguiding material over a substrate;

a first dielectric layer over the first waveguiding layer, the first dielectric layer having an atomically smooth surface;

a second dielectric layer over the atomically smooth surface of the first dielectric layer, the second dielectric layer having an atomically smooth dielectric surface; and

a second waveguiding layer comprised of a waveguiding material over the atomically smooth dielectric surface of the second dielectric layer, the second waveguiding layer patterned to define a second photonics device.

14. The device of claim 13, wherein the first and second waveguiding layers are patterned by anisotropic etching such that each of the first and second photonics devices includes a vertically extending sidewall.

15. The device of claim 13, wherein the first and second waveguiding layers are patterned by a reactive ion etching process that includes an iterative etch step followed by an iterative deposit step such that each of the first and second photonics devices includes a vertically extending sidewall.

16. The device of claim 13, wherein the first and second waveguiding layers are patterned layer to define a plurality of dummy form shapes, the dummy form shapes being spaced apart from the each of the first and second photonics devices.

17. The device of claim 13, wherein:

the first dielectric layer is formed by a silane-based high density plasma chemical vapor deposition such that the first dielectric layer is formed of silane based HDP oxide, and

the second dielectric layer is formed over the atomically smooth surface by using PECVD such that the second dielectric layer is formed of TEOS.

18. The device of claim 13, further comprising:

a third dielectric layer deposited over the second photonics device, the third dielectric layer including a polished surface;

a fourth dielectric layer over the polished surface of the third dielectric layer, the fourth dielectric layer including a polished dielectric surface; and

a third waveguiding layer over the polished dielectric surface of the fourth dielectric layer, the third waveguiding layer patterned to define a third photonics device.

19. The device of claim 13, wherein the first dielectric layer is formed from a first dielectric layer formation process, and the second dielectric layer is formed from a second dielectric layer formation process that is different from the first dielectric layer formation process.

20. The device of claim 18, wherein the third dielectric layer is formed from a third dielectric layer formation process, and the fourth dielectric layer is formed from a fourth dielectric layer formation process that is different from the third dielectric layer formation process.