

We Claim:

1. In a method of patterning a dielectric layer supported on a substrate, where the method comprises ablating the dielectric layer by exposing the dielectric layer to laser energy so as to facilitate ablation of at least a portion of the dielectric layer, the improvement being that said dielectric layer is formed from a composition comprising a polymer selected from the group consisting of polyureas, polyurethanes, and polyacylhydrazones.
2. The method of claim 1, wherein said polymer is comprises recurring diisocyanate monomers and monomers selected from the group consisting of amine-terminated sulfones, hydroxyl-terminated sulfones, and mixtures thereof.
3. The method of claim 1, wherein said polymer comprises recurring dihydrazide monomers and recurring 2-hydroxyalkyl-linked dialdehyde monomers.
4. The method of claim 1, further comprising at least one intervening layer between said dielectric layer and said substrate.
5. The method of claim 1, wherein said composition comprises a polymer dissolved or dispersed in a solvent system, and said dielectric layer is formed by applying said composition to said substrate, or to an intervening layer on said substrate, and heating said composition at a temperature of from about 50°C to about 250°C for a time period of from about 5 minutes to about 30 minutes.
6. The method of claim 1, wherein said dielectric layer is exposed to laser energy at a wavelength of from about 100 nm to about 850 nm and at a pulse rate of from about 1 Hz to about 4,000 Hz.
7. The method of claim 1, wherein said ablation yields a pattern in said dielectric layer.

8. The method of claim 7, wherein said pattern includes openings selected from the group consisting of lines, spaces, and vias.

9. The method of claim 8, wherein said lines and spaces have a width of less than
5 about 200 microns.

10. The method of claim 8, wherein said vias have a diameter of less than about 700 microns.

10 11. The method of claim 1, wherein said substrate is selected from the group consisting of silicon, SiGe, SiO₂, Si₃N₄, SiON, aluminum, tungsten, tungsten silicide, gallium arsenide, germanium, tantalum, tantalum nitride, Ti₃N₄, hafnium, HfO₂, ruthenium, indium phosphide, coral, black diamond, and glass substrates.

15 12. The method of claim 1, wherein said dielectric layer has a thickness and wherein said ablation creates an opening in said dielectric layer that does not extend across its entire thickness.

13. A structure comprising:
20 a microelectronic substrate selected from the group consisting of silicon, SiGe, SiO₂, Si₃N₄, SiON, aluminum, tungsten, tungsten silicide, gallium arsenide, germanium, tantalum, tantalum nitride, Ti₃N₄, hafnium, HfO₂, ruthenium, indium phosphide, coral, black diamond, and glass substrates; and
a dielectric layer on said substrate, said dielectric layer being formed from a composition
25 comprising a polymer selected from the group consisting of polyureas, polyurethanes, and polyacylhydrazones, said dielectric layer:

having an upper surface and a lower surface, with the upper surface being remote
from the microelectronic substrate and the lower surface being adjacent
the microelectronic substrate; and
30 comprising at least one opening formed therein, said at least one opening having an upper edge at said upper surface, there being laser ablation residue of

said polymer at, near, or both at and near said upper edge of said at least one opening.

14. The structure of claim 13, wherein said polymer is comprises recurring
5 diisocyanate monomers and monomers selected from the group consisting of amine-terminated sulfones, hydroxyl-terminated sulfones, and mixtures thereof.

15. The structure of claim 13, wherein said polymer comprises recurring dihydrazide
monomers and recurring 2-hydroxyalkyl-linked dialdehyde monomers.
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16. The structure of claim 13, further comprising at least one intervening layer
between said dielectric layer and said substrate.

17. The structure of claim 13, wherein said at least one opening is selected from the
15 group consisting of lines, spaces, and vias.

18. The structure of claim 17, wherein said lines and spaces have a width of less than
about 200 microns.

20 19. The structure of claim 17, wherein said vias have a diameter of less than about
700 microns.

20. A method of forming a polyacylhydrazone, said method comprising reacting a
dihydrazide with a 2-hydroxyalkyl-linked dialdehyde to form said polyacylhydrazone, wherein
25 the alkyl of the 2-hydroxyalkyl-linked dialdehyde has an odd number of carbon atoms.

21. The method of claim 20, wherein said polyacylhydrazone has a solubility of at
least about 10% by weight in a polar, aprotic solvent.

30 22. The method of claim 20, wherein said dihydrazide is selected from the group
consisting of adipic acid dihydrazide, isophthalic acid dihydrazide, and combinations thereof.

23. The method of claim 20, wherein said 2-hydroxyalkyl-linked dialdehyde is a 2-hydroxypropyl-linked dialdehyde.

24. The method of claim 20, wherein said 2-hydroxyalkyl-linked dialdehyde is a 2-hydroxyalkyl-linked aromatic dialdehyde.

25. The method of claim 20, said reaction being carried out in a solvent selected from the group consisting of dimethyl sulfoxide, N,N-dimethylformamide, N,N-dimethylacetamide, N-methylpyrrolidinone, and mixtures thereof, and in the presence of less than about 0.001% by weight catalyst, based upon the combined weight of dihydrazide and 2-hydroxypropyl-linked dialdehyde taken as 100% by weight.

26. A polyacylhydrazone comprising recurring monomers of a dihydrazide and a 2-hydroxyalkyl-linked dialdehyde, wherein the alkyl of the 2-hydroxyalkyl-linked dialdehyde has an odd number of carbon atoms and said polyacylhydrazone has a solubility of at least about 10% by weight in a polar, aprotic solvent.

27. The polyacylhydrazone of claim 26, wherein said dihydrazide is selected from the group consisting of adipic acid dihydrazide, isophthalic acid dihydrazide, and combinations thereof and said 2-hydroxyalkyl-linked dialdehyde is a 2-hydroxypropyl-linked aromatic dialdehyde.