

What is claimed is:

1. A resin composition, comprising:
 an epoxy resin matrix;
 a first photoacid generator including an anion having a molecular
 5 weight less than 250 g/mol; and
 a second photoacid generator including an anion having a molecular
 weight greater than about 300 g/mol;
 wherein i) a cation of the first photoacid generator has, or ii) a cation of
 the second photoacid generator has, or iii) the cations of the first and second
 10 photoacid generators have a mass attenuation coefficient of at least 0.1
 L/(g*cm) at a wavelength of incident light to cure the resin composition.

2. The resin composition as defined in claim 1, wherein the epoxy
 resin matrix comprises an epoxy material selected from the group consisting
 15 of an epoxy functionalized silsesquioxane; trimethylolpropane triglycidyl ether;
 tetrakis(epoxycyclohexyl ethyl)tetramethyl cyclotetrasiloxane; a copolymer of
 (epoxycyclohexylethyl)methylsiloxane and dimethylsiloxane; 1,3-bis[2-(3,4-
 epoxycyclohexyl) ethyl] tetramethyl disiloxane; 1,3-
 bis(glycidoxypropyl)tetramethyl disiloxane; 3,4-epoxycyclohexylmethyl-3,4-
 20 epoxycyclo-hexanecarboxylate; bis((3,4-epoxycyclohexyl)methyl) adipate; 4-
 vinyl-1-cyclohexene 1,2-epoxide; vinylcyclohexene dioxide; 4,5-
 epoxytetrahydrophthalic acid diglycidylester; 1,2-epoxy-3-phenoxypropane;
 glycidyl methacrylate; 1,2-epoxyhexadecane; poly(ethylene glycol)
 diglycidylether; pentaerythritol glycidyl ether; diglycidyl 1,2-
 25 cyclohexanedicarboxylate; tetrahydrophthalic acid diglycidyl ester; and
 combinations thereof.

3. The resin composition as defined in claim 1, wherein the first
 photoacid generator is selected from the group consisting of bis-(4-
 30 methylphenyl)iodonium hexafluorophosphate, triphenylsulfonium
 hexafluorophosphate, diaryliodonium hexafluorophosphate, and
 diaryliodonium hexafluoroantimonate.

4. The resin composition as defined in claim 1, wherein the second photoacid generator is selected from the group consisting of triphenylsulfonium tetrakis(perfluorophenyl)borate,
5 tetrakis(pentafluorophenyl)gallate, and tris[(trifluoromethyl)sulfonyl]methanide.

5. The resin composition as defined in claim 1, wherein the cation of the first photoacid generator is, or the cation of the second photoacid generator is, or the cations of the first and second photoacid generators are
10 selected from the group consisting of a diaryliodonium cation having a maximum absorption wavelength ($\lambda_{\max}$) of about 350 nm and a triphenylsulfonium cation.

6. The resin composition as defined in claim 1, wherein:
15 the cation of the second photoacid generator has the mass attenuation coefficient of at least 0.1 L/(g*cm) at the wavelength of incident light to cure the resin composition; and
the cation of the first photoacid generator has a mass attenuation coefficient less than 0.1 L/(g*cm) at the wavelength of incident light to cure
20 the resin composition.

7. The resin composition as defined in claim 6, wherein:
the cation of the second photoacid generator is selected from the group consisting of a diaryliodonium cation having a maximum absorption
25 wavelength ($\lambda_{\max}$) of about 350 nm and a triphenylsulfonium cation; and
the cation of the first photoacid generator is selected from the group consisting of a bis-(4-methylphenyl)iodonium cation, a (cumene)cyclopentadienyliron(II) cation, a ferrocene cation, a 1-naphthyl diphenyl sulfonium cation, a (4-phenylthiophenyl) diphenylsulfonium, a
30 bis(2,4,6-trimethylphenyl) iodonium cation, a bis(4-tert-butylphenyl) iodonium cation, a N-hydroxy-5-norbornene-2,3-dicarboximide perfluoro-1-butanefulfonate cation, and a triarylsulfonium cation.

8. The resin composition as defined in claim 1, wherein the cation of the first photoacid generator and the cation of the second photoacid generator have respective mass attenuation coefficients of at least 0.1 L/(g*cm) at the wavelength of incident light to cure the resin composition.

9. The resin composition as defined in claim 1, wherein:
the first photoacid generator is present in an amount ranging from about 1 mass% to about 5 mass% of total solids in the resin composition; and
the second photoacid generator is present in an amount ranging from about 0.1 mass% to about 2 mass% of total solids in the resin composition.

10. The resin composition as defined in claim 1, wherein the molecular weight of the anion of the second photoacid generator ranges from greater than about 300 g/mol to about 1,000 g/mol.

11. A resin composition, comprising:
an epoxy resin matrix including an epoxy functionalized polyhedral oligomeric silsesquioxane;
a first photoacid generator including an anion having a molecular weight less than about 250 g/mol; and
a second photoacid generator including an anion having a molecular weight ranging from about 300 g/mol to about 1,000 g/mol;
wherein i) a cation of the first photoacid generator has, or ii) a cation of the second photoacid generator has, or iii) the cations of the first and second photoacid generators have a mass attenuation coefficient of at least 0.1 L/(g*cm) at the wavelength of incident light to cure the resin composition.

12. The resin composition as defined in claim 11, wherein the epoxy functionalized polyhedral oligomeric silsesquioxane is selected from the group consisting of a glycidyl functionalized polyhedral oligomeric silsesquioxane,

an epoxycyclohexyl ethyl functionalized polyhedral oligomeric silsesquioxane, and combinations thereof.

13. The resin composition as defined in claim 11, wherein the epoxy
5 resin matrix further includes an additional epoxy material selected from the group consisting of trimethylolpropane triglycidyl ether; tetrakis(epoxycyclohexyl ethyl)tetramethyl cyclotetrasiloxane; a copolymer of (epoxycyclohexylethyl)methylsiloxane and dimethylsiloxane; 1,3-bis[2-(3,4-epoxycyclohexyl) ethyl] tetramethyl disiloxane; 1,3-
10 bis(glycidoxypropyl)tetramethyl disiloxane; 3,4-epoxycyclohexylmethyl-3,4-epoxycyclo-hexanecarboxylate; bis((3,4-epoxycyclohexyl)methyl) adipate; 4-vinyl-1-cyclohexene 1,2-epoxide; vinylcyclohexene dioxide; 4,5-epoxytetrahydrophthalic acid diglycidylester; 1,2-epoxy-3-phenoxypropane; glycidyl methacrylate; 1,2-epoxyhexadecane; poly(ethylene glycol)
15 diglycidylether; pentaerythritol glycidyl ether; diglycidyl 1,2-cyclohexanedicarboxylate; tetrahydrophthalic acid diglycidyl ester; and combinations thereof.

14. The resin composition as defined in claim 11, wherein the first
20 photoacid generator is present in an amount ranging from about 1 mass% to about 5 mass% of total solids in the resin composition.

15. The resin composition as defined in claim 11, wherein the second
photoacid generator is present in an amount ranging from about 0.1 mass%
25 to about 2 mass% of total solids in the resin composition.

16. The resin composition as defined in claim 11, wherein the first
photoacid generator is selected from the group consisting of bis-(4-methylphenyl)iodonium hexafluorophosphate, triphenylsulfonium
30 hexafluorophosphate, diaryliodonium hexafluorophosphate, and diaryliodonium hexafluoroantimonate.

17. The resin composition as defined in claim 11, wherein the second photoacid generator is selected from the group consisting of triphenylsulfonium tetrakis(perfluorophenyl)borate, tetrakis(pentafluorophenyl)gallate, and tris[(trifluoromethyl)sulfonyl]methanide.

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18. The resin composition as defined in claim 11, wherein the cation of the first photoacid generator is, or the cation of the second photoacid generator is, or both the cations of the first and second photoacid generators are selected from the group consisting of a diaryliodonium cation having a maximum absorption wavelength ($\lambda_{\max}$) of about 350 nm and a triphenylsulfonium cation.

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19. The resin composition as defined in claim 11, wherein:
the cation of the second photoacid generator has the mass attenuation coefficient of at least 0.1 L/(g*cm) at the wavelength of incident light to cure the resin composition; and

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the cation of the first photoacid generator has a mass attenuation coefficient less than 0.1 L/(g*cm) at the wavelength of incident light to cure the resin composition.

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20. The resin composition as defined in claim 19, wherein:
the cation of the second photoacid generator is selected from the group consisting of a diaryliodonium cation having a maximum absorption wavelength ($\lambda_{\max}$) of about 350 nm and a triphenylsulfonium cation; and

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the cation of the first photoacid generator is selected from the group consisting of a bis-(4-methylphenyl)iodonium cation, a (cumene)cyclopentadienyliron(II) cation, a ferrocene cation, a 1-naphthyl diphenyl sulfonium cation, a (4-phenylthiophenyl) diphenylsulfonium, a bis(2,4,6-trimethylphenyl) iodonium cation, a bis(4-tert-butylphenyl) iodonium cation, a N-hydroxy-5-norbornene-2,3-dicarboximide perfluoro-1-butanefulfonate cation, and a triarylsulfonium cation.

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21. The resin composition as defined in claim 11, wherein the cation of the first photoacid generator and the cation of the second photoacid generator have respective mass attenuation coefficients of at least 0.1 L/(g*cm) at the wavelength of incident light to cure the resin composition.

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22. A flow cell, comprising:

a substrate; and

a cured, patterned resin on the substrate, the cured, patterned resin including depressions separated by interstitial regions, and the cured,

10 patterned resin including a cured form of a resin composition including:

an epoxy resin matrix;

a first photoacid generator including an anion having a molecular weight less than about 250 g/mol; and

15 a second photoacid generator including an anion having a molecular weight greater than about 300 g/mol;

wherein i) a cation of the first photoacid generator has, or ii) a cation of the second photoacid generator has, or iii) the cations of the first and second photoacid generators have a mass attenuation coefficient of at least 0.1 L/(g*cm) at a wavelength of incident light to
20 cure the resin composition.

23. The flow cell as defined in claim 22, further comprising:

a hydrogel in the depressions; and

amplification primers attached to the hydrogel.

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24. The flow cell as defined in claim 22, wherein the epoxy resin matrix comprises an epoxy material selected from the group consisting of an epoxy functionalized silsesquioxane; trimethylolpropane triglycidyl ether; tetrakis(epoxycyclohexyl ethyl)tetramethyl cyclotetrasiloxane; a copolymer of
30 (epoxycyclohexylethyl)methylsiloxane and dimethylsiloxane; 1,3-bis[2-(3,4-epoxycyclohexyl) ethyl] tetramethyl disiloxane; 1,3-bis(glycidoxypropyl)tetramethyl disiloxane; 3,4-epoxycyclohexylmethyl-3,4-

epoxycyclo-hexanecarboxylate; bis((3,4-epoxycyclohexyl)methyl) adipate; 4-vinyl-1-cyclohexene 1,2-epoxide; vinylcyclohexene dioxide; 4,5-epoxytetrahydrophthalic acid diglycidylester; 1,2-epoxy-3-phenoxypropane; glycidyl methacrylate; 1,2-epoxyhexadecane; poly(ethylene glycol)
 5 diglycidylether; pentaerythritol glycidyl ether; diglycidyl 1,2-cyclohexanedicarboxylate; tetrahydrophthalic acid diglycidyl ester; and combinations thereof.

25. The flow cell as defined in claim 22, wherein:
 10 the first photoacid generator is selected from the group consisting of bis-(4-methylphenyl)iodonium hexafluorophosphate, triphenylsulfonium hexafluorophosphate, diaryliodonium hexafluorophosphate, and diaryliodonium hexafluoroantimonate; and
 the second photoacid generator is selected from the group consisting
 15 of triphenylsulfonium tetrakis(perfluorophenyl)borate, tetrakis(pentafluorophenyl)gallate, and tris[(trifluoromethyl)sulfonyl]methanide.

26. A method of making a flow cell, comprising:
 depositing a resin composition on a substrate, the resin composition
 20 including:
 an epoxy resin matrix;
 a first photoacid generator including an anion having a molecular weight less than about 250 g/mol; and
 a second photoacid generator including an anion having a
 25 molecular weight greater than about 300 g/mol;
 wherein i) a cation of the first photoacid generator has, or ii) a cation of the second photoacid generator has, or iii) the cations of the first and second photoacid generators have a mass attenuation
 30 coefficient of at least 0.1 L/(g*cm) at a wavelength of incident light to cure the resin composition;
 nanoimprinting the deposited resin composition using a working stamp;
 and

exposing the nanoimprinted, deposited resin composition to the incident light at an energy dose ranging from about 0.5 J to about 10 J for 30 seconds or less to form a cured, patterned resin.

- 5 27. A resin composition, comprising:
 an epoxy resin matrix;
 a first photoacid generator including a first anion having a first
 molecular weight; and
 a second photoacid generator including a second anion having a
10 second molecular weight that is at least 50 g/mol greater than the first
 molecular weight;
 wherein i) a cation of the first photoacid generator has, or ii) a cation of
 the second photoacid generator has, or iii) the cations of the first and second
 photoacid generators have a mass attenuation coefficient of at least 0.1
15 L/(g*cm) at the wavelength of incident light to cure the resin composition.