CLAIMS:

1. An etching composition, comprising:

at least one fluorine-containing acid, the at least one fluorine-containing acid comprising hydrofluoric acid or hexafluorosilicic acid;

at least one oxidizing agent;

at least one organic acid or an anhydride thereof, the at least one organic acid comprising formic acid, acetic acid, propionic acid, or butyric acid;

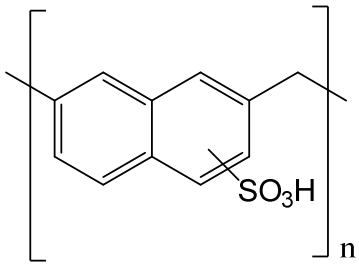
at least one polymerized naphthalene sulfonic acid;

at least one amine, the at least one amine comprising an amine of formula (I): $NR_1R_2R_3$, wherein R_1 is C_1-C_8 alkyl optionally substituted by OH or NH_2, R_2 is H or C_1-C_8 alkyl optionally substituted by OH, and R_3 is C_1-C_8 alkyl optionally substituted by OH; and

water;

wherein the composition is free of a metal salt.

2. The composition of claim 1, wherein the at least one polymerized naphthalene sulfonic acid comprises a sulfonic acid having a structure of



in which n is 3 to 6.

3. The composition of claim 1, wherein the at least one polymerized naphthalene sulfonic acid is in an amount of from about 0.005 wt% to about 0.15 wt% of the composition.

4. The composition of claim 1, wherein the amine of formula (I) is diisopropylamine, N-butyldiethanolamine, N-(3-aminopropyl)-diethanolamine, N-

octylglucamine, N-ethylglucamine, N-methylglucamine, or 1-[bis(2-hydroxyethyl)amino]-2-propanol.

5. The composition of claim 1, wherein the at least one amine is in an amount of from about 0.001 wt% to about 0.15 wt% of the composition.

6. The composition of claim 1, wherein the at least one fluorine-containing acid is in an amount of at most about 2 wt% of the composition.

7. The composition of claim 1, wherein the at least one oxidizing agent comprises hydrogen peroxide or peracetic acid.

8. The composition of claim 1, wherein the at least one oxidizing agent is in an amount of from about 5 wt% to about 20 wt% of the composition.

9. The composition of claim 1, wherein the at least one organic acid or an anhydride thereof comprises acetic acid or acetic anhydride.

10. The composition of claim 1, wherein the water is in an amount of from about 20 wt% to about 75 wt% of the composition.

11. The composition of claim 1, further comprising at least one organic solvent.

12. The composition of claim 11, wherein the at least one organic solvent comprises an alcohol or an alkylene glycol ether.

13. The composition of claim 11, wherein the at least one organic solvent comprises propylene glycol, hexylene glycol, 1,3-propanediol, or ethylene glycol butyl ether.

14. The composition of claim 11, wherein the at least one organic solvent is in an amount of from about 10 wt% to about 40 wt% of the composition.

15. The composition of claim 1, further comprising at least one sugar alcohol.

16. The composition of claim 15, wherein the at least one sugar alcohol comprises mannitol or sorbitol.

17. The composition of claim 1, further comprising at least one boronic acid.

18. The composition of claim 17, wherein the at least one boronic acid comprise phenyl boronic acid or naphthalene-1-boronic acid.

19. The composition of claim 17, wherein the at least one boronic acid is in an amount of from about 0.01 wt% to about 0.5 wt% of the composition.

20. The composition of claim 1, wherein the composition has a pH of 1-3.

21. An etching composition, comprising:

at least one fluorine-containing acid, the at least one fluorine-containing acid comprising hydrofluoric acid or hexafluorosilicic acid;

at least one oxidizing agent;

at least one organic acid or an anhydride thereof, the at least one organic acid comprising formic acid, acetic acid, propionic acid, or butyric acid;

at least one polymerized naphthalene sulfonic acid;

at least one amine, the at least one amine comprising an amine of formula (I): $N-R_1R_2R_3$, wherein R_1 is C_1-C_8 alkyl optionally substituted by OH or NH_2, R_2 is H or C_1-C_8 alkyl optionally substituted by OH, and R_3 is C_1-C_8 alkyl optionally substituted by OH; and

water;

wherein the at least one organic acid or an anhydride thereof is in an amount of from about 30 wt% to about 90 wt% of the composition.

22. The composition of claim 21, wherein the at least one organic acid or an anhydride thereof comprises acetic acid and acetic anhydride, and the total amount of the acetic acid and acetic anhydride is from about 30 wt% to about 90 wt% of the composition.

23. The composition of claim 22, wherein the total amount of the acetic acid and acetic anhydride is from about 60 wt% to about 80 wt% of the composition.

24. The composition of claim 21, further comprising an inorganic acid.

25. The composition of claim 21, wherein the composition comprises:

at least one fluorine-containing acid, the at least one fluorine-containing acid comprising hydrofluoric acid or hexafluorosilicic acid and being in an amount of at most about 2 wt% of the composition;

at least one oxidizing agent in an amount of from about 5 wt% to about 20 wt% of the composition;

at least one organic acid or an anhydride thereof, the at least one organic acid comprising formic acid, acetic acid, propionic acid, or butyric acid and being in an amount of from about 30 wt% to about 90 wt% of the composition;

at least one polymerized naphthalene sulfonic acid in an amount of from about 0.005 wt% to about 0.15 wt% of the composition;

at least one amine, the at least one amine comprising an amine of formula (I): $N\text{-}R_1R_2R_3$, wherein R_1 is C_1-C_8 alkyl optionally substituted by OH or NH_2, R_2 is H or C_1-C_8 alkyl optionally substituted by OH, and R_3 is C_1-C_8 alkyl optionally substituted by OH and the at least one amine being in an amount of from about 0.001 wt% to about 0.15 wt% of the composition; and

water.

26. The composition of claim 25, wherein the at least one fluorine-containing acid is at most about 0.5 wt% of the composition.

27. The composition of claim 25, wherein the at least one oxidizing agent is from about 6 wt% to about 10 wt% of the composition.

28. The composition of claim 25, wherein the at least one organic acid or an anhydride thereof comprises acetic acid and acetic anhydride, and the total amount of the acetic acid and acetic anhydride is from about 30 wt% to about 90 wt% of the composition.

29. The composition of claim 28, wherein the total amount of the acetic acid and acetic anhydride is from about 60 wt% to about 80 wt% of the composition.

30. The composition of claim 25, wherein the at least one polymerized naphthalene sulfonic acid is from about 0.005 wt% to about 0.05 wt% of the composition.

31. The composition of claim 25, wherein the at least one amine is from about 0.005 wt% to about 0.05 wt% of the composition.

32. The composition of claim 25, further comprising an inorganic acid.

33. A method, comprising:

contacting a semiconductor substrate containing a SiGe film with a composition of claim 1 to substantially remove the SiGe film.

34. The method of claim 33, wherein the SiGe film comprises from about 10 wt% to about 25 wt% Ge.

35. The method of claim 33, further comprising rinsing the semiconductor substrate with a rinse solvent after the contacting step.

36. The method of claim 35, further comprising drying the semiconductor substrate after the rinsing step.

37. The method of claim 33, wherein the method does not substantially remove SiN, poly-Si, or SiCO.

38. An article formed by the method of claim 33, wherein the article is a semiconductor device.

39. The article of claim 38, wherein the semiconductor device is an integrated circuit.