CLAIMS

What is claimed is:

1. An etchant composition comprising:

a halide compound;

an oxidizing agent;

a glycol solvent;

0.1% to 20% by weight of a surfactant based on a total weight of the etchant composition; and

0.01% to 10% by weight of an inhibitor based on the total weight of the etchant composition.

2. The etchant composition of claim 1, wherein the halide compound comprises at least one of hydrogen fluoride, hexafluorosilicic acid, NH_4F, NH_4F_2, HCl, HBr, or any combination thereof.

3. The etchant composition of claim 1, wherein the oxidizing agent comprises at least one of acetic acid, hydrogen peroxide, formic acid, peracetic acid, performic acid, or any combination thereof.

4. The etchant composition of claim 1, wherein the glycol solvent comprises at least one of hexylene glycol, ethylene glycol, propylene glycol, or any combination thereof.

5. The etchant composition of claim 1, wherein the surfactant comprises a disulfonic acid.

6. The etchant composition of claim 1, wherein the inhibitor comprises a polyethylenimine, a polyethylene, a polyvinylpyrrolidone, a silicic acid, a polyethylene glycol, or any combination thereof.

7. The etchant composition of claim 1, further comprising water.

8. The etchant composition of claim 1, wherein the etchant composition comprises 1% to 10% by weight of the halide compound based on the total weight of the etchant composition.

9. The etchant composition of claim 1, wherein the etchant composition comprises 20% to 80% by weight of the oxidizing agent based on the total weight of the etchant composition.

10. The etchant composition of claim 1, wherein the etchant composition comprises 1% to 30% by weight of a glycol solvent based on the total weight of the etchant composition.

11. The etchant composition of claim 1, wherein the etchant composition comprises 1% to 10% by weight of the surfactant based on the total weight of the etchant composition.

12. The etchant composition of claim 11, wherein the surfactant comprises a disulfonic acid.

13. The etchant composition of claim 1, wherein the etchant composition comprises 0.1% to 1.5% by weight of the inhibitor based on the total weight of the etchant composition.

14. The etchant composition of claim 13, wherein the inhibitor comprises polyethylenimine.

15. The etchant composition of claim 1, wherein the etchant composition comprises:

1% to 10% of the surfactant based on the total weight of the etchant composition; and

0.1% to 1.5% of the inhibitor based on the total weight of the etchant composition.

16. The etchant composition of claim 15, wherein the surfactant comprises a disulfonic acid and wherein the inhibitor comprises polyethylenimine.

17. A method for etching, the method comprising:

obtaining a substrate, the substrate comprising:

a surface comprising silicon germanium;

a surface comprising at least one of silicon oxide, silicon nitride, or any combination thereof;

obtaining an etchant composition comprising:

a halide compound;

an oxidizing agent;

a glycol solvent;

0.1% to 20% by weight of a surfactant based on a total weight of the etchant composition; and

0.01% to 10% by weight of an inhibitor based on the total weight of the etchant composition; and

contacting a substrate with the etchant composition to selectively remove silicon-germanium from the substrate.

18. The method of claim 17, wherein the etchant composition exhibits a selectivity for silicon germanium over silicon of at least 20.

19. The method of claim 17, wherein the etchant composition exhibits a selectivity for silicon germanium over silicon oxide of at least 5.

20. The method of claim 17, wherein the etchant composition exhibits a selectivity for silicon germanium over silicon nitride of at least 5.