Claims

1. A method for preventing or reducing the formation and/or accumulation of deposits in an ion source component of an ion implanter, wherein said ion source component comprises an ionization chamber and one or more components contained within said ionization chamber, said method comprising:

introducing into said ionization chamber a dopant gas, wherein said dopant gas has a composition sufficient to prevent or reduce the formation of fluorine ions/radicals during ionization; and

ionizing said dopant gas under conditions sufficient to prevent or reduce the formation and/or accumulation of deposits on the interior of said ionization chamber and/or on said one or more components contained within said ionization chamber.

2. The method of claim 1 wherein the dopant gas comprises (i) a hydrogen containing fluorinated composition, (ii) a hydrocarbon containing fluorinated composition, (iii) a hydrocarbon containing hydride composition, (iv) a halide containing composition other than a fluorinated composition, or (v) a halide containing composition comprising a fluorine and a non-fluorine containing halide.

3. The method of claim 1 wherein the dopant gas comprises a hydrogen containing fluorinated composition selected from monofluorosilane (SiH_3F), difluorosilane (SiH_2F_2), and trifluorosilane ($SiHF_3$).

4. The method of claim 1 wherein the dopant gas comprises a hydrocarbon containing fluorinated composition selected from difluoromethane (CH_2F_2), and trifluoromethane (CHF_3).

5. The method of claim 1 wherein the dopant gas comprises a hydrocarbon containing hydride composition selected from monomethylsilane ($Si(CH_3)H_3$), dimethylsilane ($Si(CH_3)_2H_2$), and trimethylsilane ($Si(CH_3)_3H$).

6. The method of claim 1 wherein the dopant gas comprises a halide containing composition other than a fluorinated composition, said halide containing composition selected from monochlorosilane (SiH_3Cl), dichlorosilane (SiH_2Cl_2), trichlorosilane ($SiCl_3H$), silicon tetrachloride ($SiCl_4$), dichlorodisilane ($Si_2Cl_2H_4$), chloromethane (CH_3Cl), dichloromethane (CH_2Cl_2), trichloromethane ($CHCl_3$), and carbon tetrachloride (CCl_4).

7. The method of claim 1 wherein the dopant gas comprises a halide containing composition comprising a fluorine and a non-fluorine containing halide, said halide containing composition selected from chlorotrifluoromethane ($CClF_3$), dichlorodifluoromethane (CCl_2F_2) , trichlorofluoromethane (CCl_3F), bromotrifluoromethane ($CBrF_3$), and dibromodifluoromethane (CBr_2F_2).

8. The method of claim 1 wherein said deposits comprise tungsten from said ionization chamber and/or from said one or more components contained within said ionization chamber.

9. The method of claim 1 wherein said method is carried out in the absence of a diluent gas.

10. The method of claim 1 wherein said method is carried out without reducing the concentration of ions to be implanted.

11. The method according to claim 1 wherein said ion source chamber includes walls made of tungsten-containing material.

12. The method of claim 1 further comprising extracting an ion beam from said ionization chamber for implantation into a substrate.

13. The method according to claim 12 wherein the substrate is a semiconductor wafer.

14. A method for the implantation of ions into a target, said method comprising:

a) providing an ion implanter having an ion source component, wherein said ion source component comprises an ionization chamber and one or more components contained within said ionization chamber;

b) providing an ion source reactant gas for providing a source of ion species to be implanted, wherein said ion source reactant gas has a composition sufficient to prevent or reduce the formation of fluorine ions/radicals during ionization;

c) introducing the ion source reactant gas into the ionization chamber;

d) ionizing the ion source reactant gas in the ionization chamber under conditions sufficient to prevent or reduce the formation and/or accumulation of deposits on the interior of said ionization chamber and/or on one or more components contained within said ionization chamber, to form ions to be implanted; and

e) extracting the ions to be implanted from said ionization chamber and directing them to said target.

15. The method of claim 14 wherein the ion source reactant comprises (i) a hydrogen containing fluorinated composition, (ii) a hydrocarbon containing fluorinated composition, (iii) a hydrocarbon containing hydride composition, (iv) a halide containing composition other than a fluorinated composition, or (v) a halide containing composition comprising a fluorine and a non-fluorine containing halide.

16. The method of claim 14 wherein the dopant gas comprises a hydrogen containing fluorinated composition selected from monofluorosilane (SiH_3F), difluorosilane (SiH_2F_2), and trifluorosilane ($SiHF_3$).

17. The method of claim 14 wherein the dopant gas comprises a hydrocarbon containing fluorinated composition selected from difluoromethane (CH_2F_2), and trifluoromethane (CHF_3).

18. The method of claim 14 wherein the dopant gas comprises a hydrocarbon containing hydride composition selected from monomethylsilane ($Si(CH_3)H_3$), dimethylsilane ($Si(CH_3)_2H_2$), and trimethylsilane ($Si(CH_3)_3H$).

19. The method of claim 14 wherein the dopant gas comprises a halide containing composition other than a fluorinated composition, said halide containing composition selected from monochlorosilane (SiH_3Cl), dichlorosilane (SiH_2Cl_2), trichlorosilane ($SiCl_3H$), silicon tetrachloride ($SiCl_4$), dichlorodisilane ($Si_2Cl_2H_4$), chloromethane (CH_3Cl), dichloromethane (CH_2Cl_2), trichloromethane ($CHCl_3$), and carbon tetrachloride (CCl_4).

20. The method of claim 14 wherein the dopant gas comprises a halide containing composition comprising a fluorine and a non-fluorine containing halide, said halide containing composition selected from chlorotrifluoromethane ($CClF_3$), dichlorodifluoromethane (CCl_2F_2), trichlorofluoromethane (CCl_3F), bromotrifluoromethane ($CBrF_3$), and dibromodifluoromethane (CBr_2F_2).

21. The method of claim 14 wherein said deposits comprise tungsten from said ionization chamber and/or from said one or more components contained within said ionization chamber.

22. The method of claim 14 wherein said method is carried out in the absence of a diluent gas.

23. The method of claim 14 wherein said method is carried out without reducing the concentration of ions to be implanted.

24. The method according to claim 14 wherein said ion source chamber includes walls made of tungsten-containing material.

25. The method according to claim 14 wherein said target is a semiconductor wafer.

Claims

1. A method for the implantation of ions into a target, said method comprising:

a) providing an ion implanter having an ion source component, wherein said ion source component comprises an ionization chamber and one or more components contained within said ionization chamber;

b) providing an ion source reactant gas for providing a source of ion species to be implanted, wherein said ion source reactant gas has a composition sufficient to prevent or reduce the formation of fluorine ions/radicals during ionization;

c) introducing the ion source reactant gas into the ionization chamber;

d) ionizing the ion source reactant gas in the ionization chamber under conditions sufficient to prevent or reduce the formation and/or accumulation of deposits on the interior of said ionization chamber and/or on one or more components contained within said ionization chamber, to form ions to be implanted;

e) extracting the ions to be implanted from said ionization chamber and directing them to said target; and

wherein said target is a semiconductor wafer.