Claims

The invention claimed is:

1. A composition suitable for ion implantation for implanting antimony-containing ions to create an n-type electronic device structure, comprising:

an antimony-containing material, said antimony-containing material chemically stable at ambient temperature and maintained under storage conditions in a liquid phase under sub-atmospheric pressure and further wherein said storage conditions are characterized by the absence of trace amounts of moisture;

said antimony-containing material represented by a non-carbon containing chemical formula; and

said antimony-containing material in the liquid phase being in substantial equilibrium with a corresponding vapor phase that is adapted to exert a sufficient vapor pressure in response to a downstream vacuum pressure condition.

2. The composition of claim 1, further comprising a hydrogen-containing compound, and further wherein the hydrogen-containing compound is in an effective amount to mitigate a halogen cycle.

3. The composition of claim 1, wherein said antimony-containing material is SbF5.

4. The composition of claim 1, wherein said antimony-containing material comprises no greater than about 50 ppm moisture.

5. The composition of claim 1, wherein said antimony-containing material is SbF5, said SbF5 maintained as a liquid at about 25 Celsius with a vapor pressure of about 10 Torr.

6. A sub-atmospheric storage and delivery vessel for a composition suitable for ion implantation for implanting antimony ions to create an n-type electronic device structure, comprising:

an antimony-containing material, said antimony-containing material chemically stable at ambient temperature;

said antimony-containing material represented by a non-carbon containing chemical formula;

a storage and delivery vessel defined, at least in part, by a moisture-free environment that is characterized by the absence of trace amounts of moisture, said storage and delivery vessel configured for holding said antimony-containing material in a liquid phase under sub-atmospheric conditions, whereby said liquid phase is in substantial equilibrium with a corresponding vapor phase occupying a headspace of the storage and delivery vessel.

7. The sub-atmospheric storage and delivery vessel of claim 6, further comprising a dual port valve assembly in mechanical communication with the storage and delivery vessel, the dual port valve comprising a fill port valve and a discharge port valve, wherein the fill port valve is in fluid communication with an interior of the storage and delivery vessel to introduce the antimony-containing material therein, and the discharge port valve is in fluid communication with a flow discharge path extending from the interior to the exterior of the storage and delivery vessel to discharge the corresponding vapor phase of the antimony-containing material therefrom.

8. The sub-atmospheric storage and delivery vessel of claim 6, wherein said antimony-containing material is stored as a liquid at about 20-25 C having a vapor pressure no greater than about 760 Torr.

9. The sub-atmospheric storage and delivery vessel of claim 6, further comprising a check valve along the flow discharge path, and further wherein said storage and delivery vessel is configured to dispense said corresponding vapor phase of the antimony-containing material from the headspace of the storage and delivery vessel in response to a downstream pressure of about 760 Torr or less.

10. The sub-atmospheric storage and delivery vessel of claim 6, further comprising a hydrogen-containing compound that is mixed with the antimony-containing material as a part of a single source supply, or is stored in a separate vessel as part of a kit.

11. A method of operating an ion source for implanting Sb-containing ions, comprising:

introducing an antimony-containing material in a vapor phase at a flow rate of at least about 0.1 sccm or greater into an arc chamber;

ionizing said antimony-containing material to produce Sb-containing ions in the arc chamber; and

implanting the Sb-containing ions into a substrate;

wherein a glitch rate is no greater than about 1 glitch per min for an ion source life about 50 hours.

12. The method of claim 11, further comprising introducing an effective amount of a hydrogen-containing compound into the arc chamber.

13. The method of claim 11, wherein said antimony-containing material as stored in the vapor phase is provided to the arc chamber in the absence of heating the vapor phase.

14. The method of claim 11, further comprising maintaining an evaporation rate of the antimony-containing material to produce the vapor phase at the flow rate of at least about 0.1 sccm or greater during the method of operating the ion source.

15. The method of claim 11, further comprising maintaining a temperature of the antimony-containing material in the vapor phase to not exceed about 65 Celsius.

16. The method of claim 11, further comprising operating the ion source at an arc voltage between about 50 to 150 V.

17. An ion source apparatus configured to perform antimony-containing ion implantation at an arc voltage less than about 150 V, said ion source adapted to receive at least about 0.1 sccm of an antimony-containing material in a vapor phase, said antimony-containing material chemically stable at ambient temperature and maintained under storage conditions in a liquid phase under sub-atmospheric pressure and further wherein said storage conditions are characterized by the absence of trace amounts of moisture;

said antimony-containing material represented by a non-carbon containing chemical formula; and

said antimony-containing material in the liquid phase being in substantial equilibrium with a corresponding vapor phase that is adapted to exert a sufficient vapor pressure in response to a downstream vacuum pressure condition.

18. The ion source apparatus of claim 17, further comprising an average glitch rate of no greater than about 1 glitch per minute during a source life of at least about 50 hours.

19. An adsorbent comprising a deliverable adsorption capacity for sub-atmospheric storage and delivery for a composition suitable for ion implantation for implanting antimony ions to create an n-type electronic device structure, said composition comprising an antimony-containing material, said antimony-containing material chemically stable at ambient temperature;

said antimony-containing material represented by a non-carbon containing chemical formula; and

said adsorbent having a moisture-free environment having a moisture no greater than about 50 ppm.