The invention claimed is:

1. A single source supply for a dopant gas mixture comprising:

one or more carbon-containing dopant source gases premixed at a predetermined concentration with a diluent gas mixture, said one or more carbon-containing sources comprising at least CO, and said diluent gas mixture comprising an inert gas and a hydrogen-containing gas; and

a sub-atmospheric delivery and storage device for maintaining the dopant gas mixture in a pressurized state within an interior volume of the device, said delivery device in fluid communication with a discharge flow path, wherein said delivery device is actuated to allow a controlled flow of the dopant composition from the interior volume of the device in response to a sub-atmospheric condition achieved along the discharge flow path.

2. The single source supply for the dopant gas mixture of claim 1, wherein the inert gas is selected from the group consisting of xenon, argon, neon, krypton or any combination thereof.

3. The single source supply for the dopant gas mixture of claim 1, wherein said one or more carbon-containing sources is selected from the group consisting of C2F6, CF4, C4F8, C2F4, CH4, C2H2 and mixtures thereof.

4. The single source supply for the dopant gas mixture of claim 1, wherein said one or more carbon-containing sources is CO, and said diluent gas mixture consists essentially of xenon and hydrogen.

5. The single source supply for the dopant gas mixture of claim 1, wherein the sub-atmospheric delivery and storage device comprises a cylinder formed from aluminum and a valve body, and further wherein said valve body is characterized by the absence of a pressure relief device.

6. The single source supply for the dopant gas mixture of claim 1, wherein the sub-atmospheric delivery and storage device comprises a combination of one or more valve elements and/or restrictive flow elements selected from the group of pressure regulators, check valves, excess flow valves and restrictive flow orifices.

7. The single source supply for the dopant gas mixture of claim 6, wherein the delivery and storage device comprises one or pressure regulators disposed in series within the interior of the cylinder.

8. The single source supply for the dopant gas mixture of claim 6, wherein the restrictive flow element comprises capillaries.

9. The single source supply for the dopant gas mixture of claim 1, wherein the delivery and storage device comprising a cylinder having an interior defined by passivating wall surfaces.

10. The single source supply for the dopant gas mixture of claim 1, said delivery and storage device characterized by an absence of adsorption media or ionic mixtures contained therewithin.

11. A method for delivering a dopant gas composition for ion implantation comprising:

actuating controlled flow of one or more carbon-containing dopant gases in response to a predetermined vacuum condition;

actuating controlled flow of a diluent gas composition in response to the predetermined vacuum condition;

introducing the one or more carbon-containing dopant gases into an ion source chamber;

introducing the diluent gas composition into the ion source chamber;

ionizing the one or more carbon-containing dopant gas sources to produce carbon ions; and

implanting the carbon ions into a substrate;

wherein the one or more carbon-containing dopant gas sources interacts with the diluents gas composition to reduce deposits along the carbon ion source without producing a substantial reduction in carbon ion beam current in comparison to pure CO.

12. The method of claim 11, wherein the one or more containing carbon sources comprises CO in a first supply source and the diluent gas composition comprises Xe and

H2 in a second supply source, wherein said Xe and H2 are in a predefined volume ratio ranging from about 0.02 to about 0.20 and the ($Xe+H_2$):CO in the ion source chamber is contained in a predefined volume ratio ranging from about 0.10 to about 0.30.

13. The method of claim 11, further comprising the step of pre-mixing the CO, xenon and hydrogen.

14. The method of claim 12, further comprising co-flowing or sequentially flowing a stream of the CO from the first supply source with a stream of the Xe and H_2 from the second supply source.

15. A gas composition comprising:

a carbon-based material comprising carbon monoxide;

an inert diluent gas mixture comprising xenon (Xe) and hydrogen (H2), wherein the Xe and the H2 are contained in an effective amount, said effective amount being in a volume ratio of Xe:H2 from about 0.02 to about 0.20; and

wherein said ($Xe+H_2$):CO is contained in a volume ratio ranging from about 0.10 to about 0.30.

16. The gas composition of claim **15**, wherein the gas composition is pre-mixed as a dopant mixture within a single source supply.

17. The gas composition of claim **16**, wherein the single source supply is a sub-atmospheric delivery and storage device for maintaining the dopant mixture in a pressurized state within an interior volume of the device, said delivery device in fluid communication with a discharge flow path, wherein said delivery device is actuated to allow a controlled flow of the dopant mixture from the interior volume of the device in response to a sub-atmospheric condition achieved along the discharge flow path and extending into an ion source chamber.

18. The gas composition of claim **15**, wherein the Xe:H2 is contained in a volume ratio ranging from about 0.02 to about 0.06.

19. The gas composition of claim **15**, wherein the ($Xe+H_2$):CO is contained in a volume ratio ranging from about 0.15 to about 0.20.

20. The gas composition of claim **15**, wherein a first supply vessel comprises CO and a second supply vessel comprises Xe and H2, said first and second vessels provided as part of a gas kit.

21. The gas composition of claim **20**, wherein each of said first and said second supply vessels is a sub-atmospheric delivery and storage device for maintaining the CO and the Xe and H2 in a pressurized state within an interior volume of the device, wherein each of said first and said second supply vessels is actuated to allow a controlled flow of the CO and the Xe and H2 from the interior volume of said corresponding first and second supply vessels in response to a sub-atmospheric condition achieved along the discharge flow path and extending into an ion source chamber.