What is claimed is:

1. A gas storage and dispensing vessel enclosing an interior volume for holding reagent gas, the vessel comprising:

a port;

a valve mounted at the port;

one or more pressure regulator(s) arranged to maintain a predetermined pressure of reagent gas discharged from the vessel; and

one or more metal-organic framework adsorbent(s) within the interior volume;

wherein the vessel is configured to be selectively actuatable to flow gas from the interior volume of the vessel, through the pressure regulator(s) and the valve, for discharge of the reagent gas from the vessel, and

wherein the vessel is configured to hold the reagent gas within the interior volume at super-atmospheric pressure, the reagent gas comprising a portion that is adsorbed on the one or more metal-organic framework adsorbent(s) and a portion that is present as condensed reagent gas or gaseous reagent gas in equilibrium with the adsorbed reagent gas.

2. The vessel of claim 1, wherein the one or more pressure regulator(s) is/are located in single or dual-stage configuration at the interior volume.

3. The vessel of claim 1, wherein the one or more of the one or more pressure regulator(s) is/are located in single or dual-stage configuration at the exterior of the vessel.

4. The vessel of claim 1, wherein the one or more metal-organic framework adsorbent(s) has a pore size in a range from 2.5 to 13 angstroms.

5. The vessel of claim 1, wherein the one or more metal-organic framework adsorbent(s) comprises a zeolitic imidazolate framework comprising tetrahedrally-coordinated transition metal atoms connected by imidazolate linkers.

6. The vessel of claim 5, wherein the transition metal atoms are zinc.

7. The vessel of claim 5, wherein the zeolitic imidazolate framework is zinc dimethylimidazolate.

8. The vessel of claim 1, wherein the one or more metal-organic framework adsorbent(s) comprises one or more materials selected from ZIF-8 (zinc dimethylimidazolate), Cu-MOF-74 (copper 2,5-dihydroxybenzenedicarboxylic acid), Ni-MOF-74 (nickel dihydroxybenzenedicarboxylic acid), Mg-MOF-74 (magnesium dihydroxybenzenedicarboxylic acid), MOF-5 (zinc oxo terephthalate), PCN-250(Fe) (iron azobenzene tetracarboxylate), and Cu-BTC(copper benzene-1,3,5- tricarboxylate).

9. The vessel of claim 1, wherein the one or more metal-organic framework adsorbent(s) is combined with another adsorbent comprising a second metal-organic framework, carbon, zeolite, silica gel, or porous organic polymer.

10. The vessel of claim 1, wherein the one or more metal-organic framework adsorbent(s) is in the form of granules, particulates, beads, pellets, disks, blocks, monolith, or space filling polyhedron.

11. The vessel of claim 1, wherein the vessel exhibits a storage capacity of the reagent gas at super-atmospheric pressure that is greater than the storage capacity of the reagent gas in a comparable vessel that has no adsorbent or comprises carbon or zeolite adsorbent instead of the one or more metal-organic framework adsorbent(s).

12. A method of supplying reagent gas from a vessel as recited in claim 1, the method comprising delivering the reagent gas from the vessel interior, to a vessel exterior, the reagent gas being delivered from the vessel at a pressure at or below 5200 Torr.

13. The method of claim 12, wherein the reagent gas is delivered at a pressure below 760 Torr.

14. The method of claim 12, further comprising delivering the reagent gas to an ion implantation device.