Claims:

1. An adsorbent-type storage system containing reagent gas and adsorbent, the system comprising a storage vessel that includes an interior, adsorbent at the interior, and reagent gas adsorbed on the adsorbent, the storage system being capable of dispensing reagent gas from the vessel with the dispensed reagent gas containing less than 150 parts per million (by volume, ppmv) of a total amount of impurities selected from CO, CO_2, N_2, CH_4, and H_2O, and combinations thereof.

2. The storage system of claim 1, the system being capable of dispensing the reagent gas from the vessel, with the dispensed reagent gas containing one or more of: less than 25 parts per million by volume CO, less than 25 parts per million by volume CO_2, less than 25 parts per million by volume N_2, less than 25 parts per million by volume CH_4, or less than 25 parts per million by volume H_2O.

3. The storage system of claim 1, the system being capable of dispensing the reagent gas from the vessel, with the dispensed reagent gas containing two or more of: less than 10 parts per million by volume CO, less than 10 parts per million by volume CO_2, less than 10 parts per million by volume N_2, less than 10 parts per million by volume CH_4, or less than 10 parts per million by volume H_2O.

4. The storage system of claim 1, the system being capable of dispensing the reagent gas from the vessel, with the dispensed reagent gas containing: less than 25 parts per million CO, less than 25 parts per million CO_2, less than 25 parts per million N_2, less than 25 parts per million CH_4, and less than 25 parts per million H_2O.

5. The storage system of claim 1 wherein the adsorbent is a carbon-based adsorbent, a metal-organic framework, or a zeolite.

6. The storage system of claim 1 wherein the adsorbent is in the form of granules, beads, pellets, or shaped monolith.

7. The storage system of claim 1 wherein the interior pressure of the vessel is below 760 Torr.

8. The storage system of claim 1 wherein the reagent gas is a hydride or a halide.

9. The storage system of claim 8 wherein:

the hydride is selected from arsine, silane, germane, methane, and phosphine, and

the halide is selected from BF_3, SiF_4, PF_3, PF_5, GeF_4, and NF_3.

10. The storage system of claim 1 wherein the adsorbent is in the form of particulates.

11. A process for storing reagent gas in a vessel that contains adsorbent, the process comprising:

providing adsorbent;

placing the adsorbent at an interior of a vessel;

exposing the adsorbent at the vessel interior to elevated temperature and reduced pressure to remove residual moisture and volatile impurities;

after exposing the adsorbent at the vessel interior to elevated temperature and reduced pressure, adding reagent gas to the vessel interior, the reagent gas becoming adsorbed onto the adsorbent,

wherein the storage system is capable of dispensing the reagent gas from the vessel with the dispensed reagent gas containing less than 150 parts per million of a total amount of impurities selected from CO, CO_2, N_2, CH_4, and H_2O, and combinations thereof.

12. The process of claim 11 comprising:

storing the reagent gas within the vessel,

dispensing the reagent gas from the vessel, with the dispensed reagent gas containing less than 50 parts per million by volume of a total amount of impurities selected from CO, CO_2, N_2, CH_4, and H_2O, and combinations thereof.

13. The process of claim 11 comprising dispensing the reagent gas from the vessel, with the dispensed reagent gas containing one or more of: less than 25 parts per million by volume CO, less than 25 parts per million by volume CO_2, less than 25 parts per million by volume N_2, less than 25 parts per million by volume CH_4, or less than 25 parts per million by volume H_2O.

14. The process of claim 11 comprising dispensing the reagent gas from the vessel, with the dispensed reagent gas containing: less than 25 parts per million by volume CO, less than 25 parts per million by volume CO_2, less than 25 parts per million by volume N_2, less than 25 parts per million by volume CH_4, and less than 25 parts per million by volume H_2O.