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, ~~particulates,~~ 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.

~~10~~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.

~~11~~12. The process of claim ~~10~~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.

~~12~~13. The process of claim ~~10~~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.

~~13~~14. The process of claim ~~10~~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.

~~14. The process of claim 10 comprising:~~

~~sintering the adsorbent before adding the adsorbent to the vessel, and~~

~~after sintering, adding the adsorbent to the vessel under an inert atmosphere, without exposing the sintered adsorbent to ambient atmosphere.~~

~~15. The process of claim 10 comprising adding the adsorbent to the vessel within 30 minutes of the end of the sintering step, while the adsorbent is at a temperature of at least 40 degrees Celsius.~~

~~16. The process of claim 10 comprising heating the vessel to elevated temperature, at a reduced pressure, before adding the adsorbent to the vessel, to remove adsorbed impurities from walls of the vessel.~~

~~17. The process of claim 10 wherein exposing the adsorbent at the vessel interior to elevated temperature and reduced pressure comprises exposing the adsorbent contained in the vessel to:~~

~~an elevated temperature in a range from 110 to 300 degrees Celsius,~~

~~at a pressure below 1 x 10^{-5} Torr,~~

~~for a period of time in a range from 8 to 40 hours,~~

~~to remove one or more impurity selected from CO, CO_2, N_2, CH_4, and H_2O from the adsorbent.~~

~~18. The process of claim 10 comprising:~~

~~passivating the adsorbent by contacting the adsorbent with passivating gas that comprises the reagent gas, and~~

~~removing the passivating gas from the adsorbent after an amount of time effective to passivate the adsorbent, and~~

~~after the passivation step, adding the reagent gas to the vessel interior.~~

~~19. The process of claim 10 comprising:~~

~~adding the reagent gas to the vessel in an amount sufficient to produce pressure (Torr, absolute) at the vessel interior that is at least 10 percent greater than a target pressure,~~

~~allowing the reagent gas at the pressure to equilibrate between adsorbed reagent gas adsorbed on the adsorbent and gaseous reagent gas contained in headspace of the vessel, and~~

~~after allowing the reagent gas to equilibrate, removing a portion of the reagent gas to reduce the pressure at the interior to the target pressure.~~