Claims

What is claimed is:

1. Ultra-pure MoO_2Cl_2 having less than about 30 ppm of protons in the physiosorbed or chemisorbed state as measured by ^1H NMR.

2. The ultra-pure MoO_2Cl_2 of claim 1 having less than 15 ppm of protons in the physiosorbed or chemisorbed state as measured by ^1H NMR.

3. The ultra-pure MoO_2Cl_2 of claim 1 having less than 3 ppm of protons in the physiosorbed or chemisorbed state as measured by ^1H NMR.

4. The ultra-pure MoO_2Cl_2 of claim 1 having a residual total content of H_2O of less than about 250 ppm in the physiosorbed or chemisorbed state as measured by ^1H NMR.

5. The ultra-pure MoO_2Cl_2 of claim 1 having a residual total content of H_2O of less than about 125 ppm in the physiosorbed or chemisorbed state as measured by ^1H NMR.

6. The ultra-pure MoO_2Cl_2 of claim 1 having a residual total content of H_2O of less than about 50 ppm in the physiosorbed or chemisorbed state as measured by ^1H NMR.

7. The ultra-pure MoO_2Cl_2 of claim 1 having a residual total content of H_2O of less than about 15 ppm in the physiosorbed or chemisorbed state as measured by ^1H NMR.

8. The ultra-pure MoO_2Cl_2 of claim 1 having a residual total content of H_2O as determined by ^1H NMR of less than about 0.005 wt % in the physiosorbed or chemisorbed state.

9. The ultra-pure MoO_2Cl_2 of claim 1 having a residual total content of HCl of less than about 1000 ppm in the physiosorbed or chemisorbed state as measured by ^1H NMR.

10. The ultra-pure MoO_2Cl_2 of claim 1 having a residual total content of MoO_2Cl_2 x H_2O as determined by ^1H NMR of less than about 0.30 wt % in the physiosorbed or chemisorbed state.

11. The ultra-pure MoO_2Cl_2 of claim 1 having a residual total content of MoO_2Cl_2 x H_2O as determined by ^1H NMR of less than about 0.10 wt % in the physiosorbed or chemisorbed state.

12. The ultra-pure MoO_2Cl_2 of claim 1 having a residual total content of MoO_3 of less than about 0.20 wt % in the physiosorbed or chemisorbed state.

13. The ultra-pure MoO_2Cl_2 of any of claims 1-12, wherein the ultra-pure MoO_2Cl_2 has a bulk density of greater than about 2.0 g/cm^3.

14. The ultra-pure MoO_2Cl_2 of any of claims 1-12, wherein the ultra-pure MoO_2Cl_2 has a bulk density of greater than about 2.5 g/cm^3.

15. The ultra-pure MoO_2Cl_2 of any of claims 1-12, wherein the ultra-pure MoO_2Cl_2 has a bulk density of greater than about 3.0 g/cm^3.

16. A method of preparing the ultra-pure MoO_2Cl_2 of claim 1 comprising the steps of:

a. charging low purity MoO_2Cl_2 into a pressure vessel;

b. heating the vessel to a temperature sufficient to melt the low purity MoO_2Cl_2;

c. optionally filtering the melted MoO_2Cl_2;

d. venting the vessel to remove impurities; and

e. cooling the vessel; and

f. optionally re-venting the vessel.

17. The method of claim 16, wherein the step b. heating comprises heating the vessel to a temperature from about 180 °C to about 200 °C.

18. A container comprising the ultra-pure MoO_2Cl_2 of claim 1 having a packing density of about 0.7 kg/L to about 1.5 kg/L of container external volume.

19. A vapor comprising the ultra-pure MoO_2Cl_2 of claim 1 wherein the vapor has less than 300 ppm volume of gaseous HCl.