CLAIMS

1. A composition for depositing a tungsten film or tungsten-containing film by a chemical vapor deposition or atomic layer deposition process, the composition comprising:

   at least 90% by weight or greater of β- WCl_6

   wherein the composition is derived from a mixture comprising α- WCl_6 and β- WCl_6.

2. The composition of claim 1, wherein the composition comprises at least 95% by weight or greater of β- WCl_6 and 5% by weight or less of α- WCl_6.

3. The composition of claim 2, wherein the composition further comprises 1% by weight or less of $WOCl_4$.

4. The composition of claim 1, wherein the composition comprises at least 99% by weight or greater of β- WCl_6 and 1% by weight or less of α- WCl_6.

5. The composition of claim 4, wherein the composition comprises at least 99.9% by weight or greater of β- WCl_6.

6. A delivery system for depositing a tungsten film or tungsten-containing film comprising:

   a composition comprising at least 90% by weight or greater of β-WCl_6;

   a vessel; and

   wherein the composition is inside the vessel.

7. The delivery system of claim 6, wherein the composition comprises at least 95% by weight or greater of β- WCl_6 and 5% by weight or less of α- WCl_6.

8. The delivery system of claim 6, wherein the composition comprises at least 99% by weight or greater of β- WCl_6 and 1% by weight or less of α- WCl_6.

9. The delivery system of claim 6, wherein the composition comprises at least 99.9% by weight or greater of β- WCl_6.

10. A process of preparing a delivery system for depositing a tungsten film or tungsten-containing film comprising:

providing a vessel;

providing a composition comprising at least 90 % by weight of WCl_6 wherein the composition is inside the vessel; and

heating the vessel to at least 100°C until 90.0 % by weight of WCl_6 is β- WCl_6.

11. The process of Claim 10, wherein the heating is performed until 95.0 % by weight of WCl_6 is β- WCl_6.

12. The process of Claim 10, wherein the heating is performed until 99.0 % by weight of WCl_6 is β- WCl_6.

13. The process of Claim 10, wherein the heating is performed until 99.9 % by weight of WCl_6 is β- WCl_6.

14. A system for obtaining a purified material comprising at least 90% by weight or greater of β-WCl_6 by purifying a crude material comprising WCl_6 and at least one impurity comprising:

(a) at least one boiler;

(b) a condenser;

(c) a connector in fluid communication with the boiler and the condenser;

(d) a carrier gas in fluid communication with the boiler; and

(e) a fluidizing gas in fluid communication with the connector and the condenser;

wherein

the at least one impurity comprises at least one of trace metals, tungsten oxytetrachloride ($WOCl_4$), and tungsten pentachloride (WCl_5);

the at least one boiler is maintained at a temperature above the boiling point of WCl_6 to convert filled crude material to gaseous phase, which is mixed with the carrier gas to obtain boiler vapor stream;

the connector is filled with the boiler vapor stream;

the condenser containing the fluidizing gas is mixed with the boiler vapor stream to obtain a condenser vapor containing purified material

comprising WCl_6 at the bottom of the condenser while the fluidizing gas carries the at least one impurity to the top of the condenser;
the carrier gas and the fluidizing gas are not reacted with WCl_6; and
the fluidizing gas is cooler than the boiler vapor stream.

15. The system of Claim 14, wherein the at least one boiler is maintained at >300 ^{0}C; and the condenser vapor is maintained at one or more temperatures ranging from about 100 to about 180 °C.

16. The system of Claim 14; wherein a molar ration of the fluidizing gas and the boiler vapor stream is <200:1; and a molar ration of the carrier gas to the crude material in the boiler vapor stream is <10:1.

17. The system of Claim 14; wherein the condenser further comprises a dip tube in fluid communication with a vacuum pump to withdraw the purified material comprising WCl_6 from the bottom of the condenser.

18. The system of Claim 14; wherein the purified material comprising WCl_6 comprises at least 99% by weight or greater of β-WCl_6.

19. The system of Claim 14; wherein the system further comprises a vessel in fluid communication with the dip tube for housing the purified material comprising WCl_6 wherein the purified material comprising WCl_6 comprises at least 90% or 99 % by weight or greater of β-WCl_6.

CLAIMS

1. A composition for depositing a tungsten film or tungsten-containing film by a chemical vapor deposition or atomic layer deposition process, the composition comprising:

   at least 90% by weight or greater of β- WCl_6.

2. The composition of claim 1, wherein the composition comprises at least 95% by weight or greater of β- WCl_6 and 5% by weight or less of α- WCl_6.

3. The composition of claim 2, wherein the composition further comprises 1% by weight or less of $WOCl_4$.

4. The composition of claim 1, wherein the composition comprises at least 99% by weight or greater of β- WCl_6 and 1% by weight or less of α- WCl_6.

5. The composition of claim 4, wherein the composition comprises at least 99.9% by weight or greater of β- WCl_6.

6. A delivery system for depositing a tungsten film or tungsten-containing film comprising:

   a composition comprising at least 90% by weight or greater of β-WCl_6;

   a vessel; and

   wherein the composition is inside the vessel.

7. The delivery system of claim 6, wherein the composition comprises at least 95% by weight or greater of β- WCl_6 and 5% by weight or less of α- WCl_6.

8. The delivery system of claim 6, wherein the composition comprises at least 99.9% by weight or greater of β- WCl_6 and 1% by weight or less of α- WCl_6.

9. The delivery system of claim 6, wherein the composition comprises at least 99.9% by weight or greater of β- WCl_6.

10. A process of preparing a delivery system for depositing a tungsten film or tungsten-containing film comprising:

providing a vessel;

providing a composition comprising at least 90 % by weight of WCl_6 wherein the composition is inside the vessel; and

heating the vessel until 90.0 % by weight of WCl_6 is β- WCl_6.

11. The process of Claim 10, wherein the heating is performed until 95.0 % by weight of WCl_6 is β- WCl_6.

12. The process of Claim 10, wherein the heating is performed until 99.0 % by weight of WCl_6 is β- WCl_6.

13. The process of Claim 10, wherein the heating is performed until 99.9 % by weight of WCl_6 is β- WCl_6.

14. A system for purifying a crude material comprising WCl_6 and at least one impurity comprising:

(a) at least one boiler;

(b) a condenser;

(c) a connector in fluid communication with the boiler and the condenser;

(d) a carrier gas in fluid communication with the boiler; and

(e) a fluidizing gas in fluid communication with the connector and the condenser;

wherein

the at least one impurity comprising at least one of trace metals, tungsten oxytetrachloride ($WOCl_4$), and tungsten pentachloride (WCl_5);

the at least one boiler is maintained at a temperature above the boiling point of WCl_6 to convert filled crude material to gaseous phase mixing with the carrier gas to obtain boiler vapor stream;

the connector is filled with the boiler vapor stream;

the condenser containing the fluidizing gas mixing with the boiler vapor stream to obtain a condenser vapor containing purified material

comprising WCl_6 at the bottom of the condenser while the fluidizing gas carrying the at least one impurity to the top of the condenser;
the carrier gas and the fluidizing gas are not react with WCl_6; and
the fluidizing gas is cooler than the boiler vapor stream.

15. The system of Claim 14, wherein the at least one boiler is maintained at >300 ^{0}C; and the condenser vapor is maintained at one or more temperatures ranging from about 100 to about 180 °C.

16. The system of Claim 14; wherein a molar ration of the fluidizing gas and the boiler vapor stream is <200:1; and a molar ration of the carrier gas to the crude material in the boiler vapor stream is <10:1.

17. The system of Claim 14; wherein the condenser further comprises a dip tube in fluid communication with a vacuum pump to withdraw the purified material comprising WCl_6 from the bottom of the condenser.

18. The system of Claim 14; wherein the purified material comprising WCl_6 comprises at least 90% by weight or greater of β-WCl_6.

19. The system of Claim 14; wherein the purified material comprising WCl_6 comprises at least 99% by weight or greater of β-WCl_6.

20. The system of Claim 14; wherein the system further comprises a vessel in fluid communication with the dip tube for housing the purified material comprising WCl_6 wherein the purified material comprising WCl_6 comprises at least 90% or 99 % by weight or greater of β-WCl_6.