CLAIMS

1. A process for purifying technical grade trichlorosilane and/or technical grade silicon tetrachloride into electronic grade trichlorosilane and/or electronic grade silicon tetrachloride, the process comprising:

adding diphenylthiocarbazoneor triphenylchloromethane to the technical grade trichlorosilane or technical grade silicon tetrachloride to form complex impurity macromolecules with impurities in the technical grade trichlorosilane and/or technical grade silicon tetrachloride, the impurities being selected from the group consisting of boron impurities, metallic impurities, and combinations thereof;

distilling the technical grade trichlorosilane and/or technical grade silicon tetrachloride having complex impurity macromolecules in a first column distillation, wherein the first column distillation results in first distillation tops and first distillation bottoms, wherein the first distillation bottoms comprise complex impurity macromolecules separated from the first distillation tops; and

distilling the first distillation tops in a second column distillation resulting in second distillation tops and second distillation bottoms, wherein the second distillation bottoms comprise a residual amount of trichlorosilane and/or silicon tetrachloride and a compound selected from the group consisting of phosphorus containing compounds, arsenic containing compounds, aluminum compounds, antimony compounds, metalloid compounds, carbosilane compounds, and combinations thereof, and the second distillation tops comprise electronic grade trichlorosilane and/or electronic grade silicon tetrachloride.

2. The process as set forth in claim 1 wherein adding diphenylthiocarbazoneor triphenylchloromethane to the technical grade trichlorosilane and/or technical grade silicon tetrachloride comprises adding the diphenylthiocarbazoneor triphenylchloromethane in an excess stoichiometric amount.

3. The process as set forth in claim 1 wherein the first distillation bottoms are at a temperature between 38°C and 48°C for the purification of technical grade trichlorosilane and between 65°C and 75°C for the purification of technical grade silicon tetrachloride.

4. The process as set forth in claim 3 wherein the first distillation bottoms are at a temperature of 42°C for the purification of trichlorosilane and 69°C for the purification of silicon tetrachloride.

5. The process as set forth in claim 1 wherein the first column distillation initially operated with a total reflux of the first distillation such that the impurities completely form complex impurity macromolecules.

6. The process as set forth in claim 1 wherein the boron impurities include boron trichloride, the phosphorous containing compounds include phosphorous chloride and the arsenic containing compounds include arsenic chloride.

7. A system for purifying technical grade trichlorosilane and/or technical grade silicon tetrachloride into electronic grade trichlorosilane and/or electronic grade silicon tetrachloride comprising:

a first distillation column for adding diphenylthiocarbazone and/or triphenylchloromethane to the technical grade trichlorosilane and/or technical grade silicon tetrachloride to form complex impurity macromolecules with impurities in the technical grade trichlorosilane and/or technical grade silicon tetrachloride, the impurities being selected from the group consisting of boron impurities, metallic impurities, and combinations thereof, and wherein the complexed technical grade trichlorosilane and/or technical grade silicon tetrachloride is distilled into first distillation tops and first distillation bottoms, and

a second distillation column for distilling the first distillation tops into second distillation tops and second distillation bottoms, the second distillation bottoms comprising a residual amount of trichlorosilane and/or silicon tetrachloride and a compound selected from the group consisting of phosphorus containing compounds, arsenic containing compounds, aluminum compounds, antimony compounds, metalloid compounds, carbosilane compounds, and combinations thereof, and the second distillation tops comprising electronic grade trichlorosilane and/or electronic grade silicon tetrachloride.

8. The system as set forth in claim 7, the system further comprising a vessel between the first distillation column and the second distillation column, wherein the first distillation tops are collected as a feed reservoir for the second distillation column.

9. The system as set forth in claim 7, the system further comprising a third distillation column for distilling the second distillation bottoms into third distillation tops and third distillation bottoms, wherein the third distillation bottoms comprise a compound selected from the group consisting of phosphorus containing compounds, arsenic containing compounds, aluminum compounds, antimony compounds, metalloid compounds, carbosilane compounds, and combinations thereof, and the third distillation tops comprise silicon tetrachloride and/or trichlorosilane free of dichlorosilane.

10. The system as set forth in claim 7 wherein the temperature at the bottom of the first distillation column is between 38°C and 48°C for trichlorosilane and between 65°C and 75°C for silicon tetrachloride.

11. The system as set forth in claim 10 wherein the temperature at the bottom of the first distillation column is 42°C for trichlorosilane and 69°C for silicon tetrachloride.

12. The system as set forth in claim 10 wherein the system further comprises a thermal fluid in a first column bottom exchanger at the bottom of the first distillation column, the temperature of the thermal fluid being between 58°C and 73°C for trichlorosilane and between 75°C and 83°C for silicon tetrachloride.

13. The system as set forth in claim 12 wherein the temperature of the thermal fluid being 60°C for trichlorosilane and 79°C for silicon tetrachloride.

14. The system as set forth in claim 7 wherein the system further comprises a linking conduit between the first distillation column and the second distillation column.

What is claimed is:

1. A process for purifying technical grade trichlorosilane or technical grade silicon tetrachloride into electronic grade trichlorosilane or electronic grade silicon tetrachloride, the process comprising:

> adding diphenylthiocarbazone or triphenylchloromethane to the technical grade trichlorosilane or technical grade silicon tetrachloride to form complex impurity macromolecules with impurities in the technical grade trichlorosilane or technical grade silicon tetrachloride, the impurities being selected from the group consisting of boron impurities, metallic impurities, and combinations thereof;

distilling the technical grade trichlorosilane or technical grade silicon tetrachloride having complex impurity macromolecules in a first column distillation, wherein the first column distillation results in first distillation tops and first distillation bottoms, wherein the first distillation bottoms comprise complex impurity macromolecules separated from the first distillation tops; and distilling the first distillation tops in a second column distillation resulting in second distillation tops and second distillation bottoms, wherein the second distillation bottoms comprise a residual amount of trichlorosilane or silicon tetrachloride and a compound selected from the group consisting of phosphorus containing compounds, arsenic containing compounds, aluminum compounds, antimony compounds, carbosilane compounds, and combinations thereof, and the second distillation tops comprise electronic grade trichlorosilane or electronic grade silicon tetrachloride.

2. The process as set forth in claim **1** wherein adding diphenylthiocarbazone or triphenylchloromethane to the technical grade trichlorosilane or technical grade silicon tetrachloride comprises adding the diphenylthiocarbazone or triphenylchloromethane in an excess stoichiometric amount.

3. The process as set forth in claim **1** wherein the first distillation bottoms are at a temperature between 38^0C. and 48^0C. for the purification of technical grade trichlorosilane and between 65^0C. and 75^0C. for the purification of technical grade silicon tetrachloride.

4. The process as set forth in claim **3** wherein the first distillation bottoms are at a temperature of 42^0C. for the purification of trichlorosilane and 69^0C. for the purification of silicon tetrachloride.

5. The process as set forth in claim **1** wherein the first column distillation initially operated with a total reflux of the first distillation such that the impurities completely form complex impurity macromolecules.

6. The process as set forth in claim **1** wherein the boron impurities include boron trichloride, the phosphorous containing compounds include phosphorous chloride and the arsenic containing compounds include arsenic chloride.

7. A process for purifying technical grade trichlorosilane or technical grade silicon tetrachloride into electronic grade trichlorosilane or electronic grade silicon tetrachloride, the process comprising:

> adding diphenylthiocarbazone or triphenylchloromethane to the technical grade trichlorosilane or technical grade silicon tetrachloride to form complex impurity macromolecules with impurities in the technical grade trichlorosilane or technical grade silicon tetrachloride, the impurities being selected from the group consisting of boron impurities, metallic impurities, and combinations thereof;

distilling the technical grade trichlorosilane or technical grade silicon tetrachloride having complex impurity macromolecules in a first column distillation, wherein the first column distillation results in first distillation tops and first distillation bottoms, wherein the first distillation bottoms comprise complex impurity macromolecules separated from the first distillation tops; and distilling the first distillation tops in a second column distillation resulting in second distillation tops and second distillation bottoms, wherein the second distillation bottoms comprise a residual amount of trichlorosilane or silicon

tetrachloride and a metalloid compound, and the second distillation tops comprise electronic grade trichlorosilane or electronic grade silicon tetrachloride.

8. The process as set forth in claim **7** wherein adding diphenylthiocarbazone or triphenylchloromethane to the technical grade trichlorosilane or technical grade silicon tetrachloride comprises adding the diphenylthiocarbazone or triphenylchloromethane in an excess stoichiometric amount.

9. The process as set forth in claim **7** wherein the first distillation bottoms are at a temperature between 38^0C. and 48^0C. for the purification of technical grade trichlorosilane and between 65^0C. and 75^0C. for the purification of technical grade silicon tetrachloride.

10. The process as set forth in claim **9** wherein the first distillation bottoms are at a temperature of 42^0C. for the purification of trichlorosilane and 69^0C. for the purification of silicon tetrachloride.

11. The process as set forth in claim **7** wherein the first column distillation initially operated with a total reflux of the first distillation such that the impurities completely form complex impurity macromolecules.

12. The process as set forth in claim **7** wherein the boron impurities include boron trichloride, the phosphorous containing compounds include phosphorous chloride and the arsenic containing compounds include arsenic chloride.