What is claimed is:

1. A process for removing mercaptans from a gas phase mixture, comprising the steps of:

(a) feeding to a reactor a gas phase mixture comprising hydrocarbons and mercaptans, wherein the reactor comprises a catalyst which is capable of catalyzing the thioetherification of mercaptans to thioethers to produce a reactor product mixture;

(b) feeding the reactor product mixture to a distillation unit comprising an upper section and a lower section;

(c) separating lower boiling point hydrocarbons from the thioethers wherein the lower boiling point hydrocarbons are substantially contained in the upper section and the thioethers are substantially contained in the lower section; and

(d) recovering the lower boiling point hydrocarbons from the upper section.

2. The process of claim 1, wherein the catalyst comprises greater than 100 ppm by weight palladium and greater than 50 ppm by weight silver.

3. The process of claim 1, wherein the catalyst comprises greater than 500 ppm by weight palladium and greater than 100 ppm by weight silver.

4. The process of claim 2, wherein the molar ratio of palladium to silver is between 0.1 to 10.

5. The process of claim 2, wherein the molar ratio of palladium to silver is between 0.2 to 0.5.

6. The process of claim 1, wherein the reactor is operated at a pressure of between 100 psig to 250 psig and a temperature of 120°F to 250°F.

7. A process for removing mercaptans from a gas phase mixture, comprising the steps of:

(a) feeding to a distillation unit a gas phase comprising hydrocarbons and mercaptans, wherein the distillation unit comprises (i) a first catalyst which is capable of catalyzing the thioetherification of mercaptans to thioethers, (ii) an upper section; (iii) a lower section, and (iv) a gas phase mixture feed point, wherein the feed point is positioned between the first catalyst and the lower section,

(b) separating lower boiling point hydrocarbons from the thioethers wherein the lower boiling point hydrocarbons are substantially contained in the upper section and the thioethers are substantially contained in the lower section; and

(c) recovering the lower boiling point hydrocarbons from the upper section.

8. The process of claim 7, wherein the catalyst comprises greater than 100 ppm by weight palladium and greater than 50 ppm by weight silver.

9. The process of claim 7, wherein the catalyst comprises greater than 500 ppm by weight palladium and greater than 100 ppm by weight silver.

10. The process of claim 8, wherein the molar ratio of palladium to silver is between 0.1 to 10.

11. The process of claim 8, wherein the molar ratio of palladium to silver is between 0.2 to 0.5.

12. The process of claim 7, wherein the reactor is operated at a pressure of between 100 psig to 250 psig and a temperature of 120°F to 250°F.

13. A process for removing mercaptans from a gas phase mixture, comprising the steps of:

(a) feeding to a reactor hydrogen gas and a liquefied petroleum gas mixture comprising hydrocarbons and mercaptans to produce a reactor product mixture, wherein the reactor comprises a catalyst which is capable of catalyzing the thioetherification of mercaptans to thioethers;

(b) feeding the reactor product mixture to a distillation unit, wherein the distillation unit comprics an upper section and a lower section;

(c) separating lower boiling point hydrocarbons from the thioethers wherein the lower boiling point hydrocarbons are substantially contained in the upper section and the thioethers are substantially contained in the lower section; and

(d) recovering the lower boiling point hydrocarbons from the upper section.

14. The process of claim 13, wherein the catalyst comprises greater than 100 ppm by weight palladium and greater than 50 ppm by weight silver.

15. The process of claim 13, wherein the catalyst comprises greater than 500 ppm by weight palladium and greater than 100 ppm by weight silver.

16. The process of claim 14, wherein the molar ratio of palladium to silver is between 0.1 to 10.

17. The process of claim 14, wherein the molar ratio of palladium to silver is between 0.2 to 0.5.

18. The process of claim 13, wherein the reactor is operated at a pressure of between 100 psig to 250 psig and a temperature of 120°F to 250°F.

19. The process of claim 8 wherein the distillation column further comprises a second catalyst wherein the second catalyst is positioned between the first catalyst and the upper section.

20. The process of claim 13 wherein the hydrogen gas is mixed with the liquefied petroleum gas mixture prior to being fed to the reactor.

CLAIMS

1. A process comprising: (a) feeding to a reactor a gas phase mixture comprising C_2-C_4 hydrocarbons and 20-1000 ppm mercaptans, wherein the reactor comprises a catalyst which is capable of catalyzing the thioetherification of mercaptans to thioethers by reacting mercaptans with C_2 hydrocarbons and C_3 hydrocarbons in a gas phase at a pressure in the range of 100 psig to 250 psig, producing a reactor product mixture, the catalyst containing greater than 200 ppm of palladium, and a molar ratio of palladium to silver in the range of 0.1 to 10; (b) feeding the reactor product mixture to a distillation unit comprising an upper section and a lower section; (c) separating lower boiling point hydrocarbons from the thioethers wherein the lower boiling point hydrocarbons are substantially contained in the upper section and the thioethers are substantially contained in the lower section; and (d) recovering the lower boiling point hydrocarbons from the upper section in an overhead stream containing less than 5 ppm mercaptans.

2. The process of claim 1, wherein the catalyst comprises greater than 50 ppm by weight silver.

3. The process of claim 2, wherein the molar ratio of palladium to silver is between 0.2 to 0.5.

4. The process of claim 1, wherein the catalyst comprises greater than 500 ppm by weight palladium and greater than 100 ppm by weight silver.

5. The process of claim 1, wherein the reactor is operated at a pressure of between 100 psig to 250 psig and a temperature of 120° F. to 250° F.

6. The process of claim 1, wherein the catalyzing metals in the catalyst consist essentially of palladium and silver.

7. A process comprising the steps of: (a) feeding to a distillation unit a gas phase comprising C_2-C_4 hydrocarbons and 20-1000 ppm mercaptans, wherein the distillation unit comprises (i) a first catalyst which is capable of catalyzing the thioetherification of mercaptans to thioethers by reacting mercaptans with C_2 hydrocarbons and C_3 hydrocarbons in a gas

phase at a pressure in the range of 100 psig to 250 psig, the catalyst containing greater than 200 ppm of palladium, and a molar ratio of palladium to silver in the range of 0.1 to 10; (ii) an upper section; (iii) a lower section, and (iv) a gas phase mixture feed point, wherein the feed point is positioned between the first catalyst and the lower section, (b) separating lower boiling point hydrocarbons from the thioethers wherein the lower boiling point hydrocarbons are substantially contained in the upper section and the thioethers are substantially contained in the lower section; and (c) recovering the lower boiling point hydrocarbons from the upper section in an overhead stream containing less than 5 ppm mercaptans.

8. The process of claim 7, wherein the catalyst comprises greater than 50 ppm by weight silver.

9. The process of claim 8, wherein the molar ratio of palladium to silver is between 0.2 to 0.5.

10. The process of claim 8 wherein the distillation column further comprises a second catalyst wherein the second catalyst is positioned between the first catalyst and the upper section.

11. The process of claim 7, wherein the catalyst comprises greater than 500 ppm by weight palladium and greater than 100 ppm by weight silver.

12. The process of claim 7, wherein the reactor is operated at a pressure of between 100 psig to 250 psig and a temperature of 120° F. to 250° F.

13. The process of claim 7, wherein the catalyzing metals in the catalyst consist essentially of palladium and silver.

14. A process comprising: (a) feeding to a reactor hydrogen gas and a gas mixture comprising C_2-C_4 hydrocarbons and 20-1000 ppm mercaptans to produce a reactor product mixture, wherein the reactor comprises a catalyst which is capable of catalyzing the thioetherification of mercaptans to thioethers by reacting mercaptans with C_2 hydrocarbons and C_3 hydrocarbons in a gas phase at a pressure in the range of 100 psig to 250 psig, the catalyst containing greater than 200 ppm of palladium, and a molar ratio of palladium to silver

in the range of 0.1 to 10; (b) feeding the reactor product mixture to a distillation unit, wherein the distillation unit comprises an upper section and a lower section; (c) separating lower boiling point hydrocarbons from the thioethers wherein the lower boiling point hydrocarbons are substantially contained in the upper section and the thioethers are substantially contained in the lower section; and (d) recovering the lower boiling point hydrocarbons from the upper section in an overhead stream containing less than 5 ppm mercaptans.

15. The process of claim 14, wherein the catalyst comprises greater than 50 ppm by weight silver.

16. The process of claim 15, wherein the molar ratio of palladium to silver is between 0.2 to 0.5.

17. The process of claim 14, wherein the catalyst comprises greater than 500 ppm by weight palladium and greater than 100 ppm by weight silver.

18. The process of claim 14, wherein the reactor is operated at a pressure of between 100 psig to 250 psig and a temperature of 120° F. to 250° F.

19. The process of claim 14 wherein the hydrogen gas is mixed with the liquefied petroleum gas mixture prior to being fed to the reactor.

20. The process of claim 14, wherein the catalyzing metals in the catalyst consist essentially of palladium and silver.