CLAIMS

1. A process for conversion of dimethyl sulfide to methyl mercaptan, comprising:

   contacting dimethyl sulfide in a combined feed stream with a catalyst in the presence of an excess amount of hydrogen sulfide in a reactor to yield a reactor effluent comprising methyl mercaptan, hydrogen sulfide, and carbon disulfide, wherein the catalyst consists of NiMo on an alumina support; CoMo on an alumina support; NiMO on an alumina support and CoMo on an alumina support; NiMo on an alumina support and alumina; CoMo on an alumina support and alumina; or NiMo on an alumina support, CoMo on an alumina support, and alumina;

   wherein the step of contacting in a single pass through the reactor has, in the reactor effluent, a conversion of dimethyl sulfide of greater than 50% and a selectivity to methyl mercaptan of greater than 95%,

   wherein carbon disulfide is present in the reactor effluent in an amount of less than about 2 mole% based on a total moles of methyl mercaptan, hydrogen sulfide, dimethyl disulfide, and carbon disulfide in the reactor effluent.

2. The process of claim 1, further comprising:

   separating the reactor effluent into a recycle H_2S stream and a methyl mercaptan stream; and

   recycling the recycle H_2S stream for use in the step of contacting.

3. The process of claim 1, wherein the step of contacting is performed at a hydrogen sulfide to dimethyl sulfide mole ratio of at least 3:1 and less than 100:1.

4. The process of claim 1, wherein the step of contacting is performed at a weight average temperature in a range of from about 265° C. to about 305° C.

5. The process of claim 1, wherein the step of contacting is performed at a weight hourly space velocity of about 0.2 to about 15 g dimethyl sulfide/g cat./hr.

6. The process of claim 1, wherein the step of contacting is performed at a hydrogen sulfide to dimethyl sulfide mole ratio of about 10:1, a weight hourly space velocity of about 1.5 g dimethyl sulfide/g cat./hr, and a weight average temperature of about 285° C.

7. The process of claim 1, further comprising;

   combining hydrogen sulfide and dimethyl sulfide received from a methyl mercaptan production plant to yield a combined feed stream comprising hydrogen sulfide and dimethyl sulfide; and

   feeding the hydrogen sulfide and dimethyl sulfide to the reactor via the combined feed stream.

8. The process of claim 7, wherein one or more purge streams of the methyl mercaptan production plant comprises dimethyl sulfide in an amount which is less than about 5 wt% based on a weight of dimethyl sulfide fed to the reactor.

9. The process of claim 7, wherein the step of feeding comprises:

   preheating the combined feed stream in a cross-flow heat exchanger using the reactor effluent as a heat transfer medium to yield a heated feed stream; and

   flowing the heated feed stream to the reactor.

10. The process of claim 1, further comprising:

    flowing a H_2S stream comprising hydrogen sulfide to the reactor, wherein the hydrogen sulfide in the H_2S stream is received from a methyl mercaptan production plant; and

    flowing a DMS stream comprising dimethyl sulfide to the DMS cleavage reactor, wherein the dimethyl sulfide in the DMS stream is received from the methyl mercaptan production plant.

11. The process of claim 1, further comprising:

    cooling the reactor effluent to yield a cooled reactor effluent; and

recycling the cooled reactor effluent to a methyl mercaptan production plant.

12. The process of claim 11, further comprising:

recovering a MeSH product stream comprising methyl mercaptan from the methyl mercaptan production plant, wherein the MeSH product stream farther comprises less than about 5 ppmw carbon disulfide based on a total weight of the MeSH product stream.

13. The process of claim 12, further comprising:

recovering one or more purge streams from the methyl mercaptan production plant, wherein the one or more purge streams comprises equal to or less than about 10 mole% carbon disulfide based on a total moles in the one or more purge streams.

14. The process of claim 1, further comprising:

cooling the reactor effluent to yield a cooled reactor effluent;

separating the cooled reactor effluent into an enriched H_2S stream comprising hydrogen sulfide and an enriched MeSH stream comprising methyl mercaptan; and

recycling the methyl mercaptan in the enriched MeSH stream to a methyl mercaptan production plant separately from recycling the hydrogen. sulfide in the enriched H_2S stream to the methyl mercaptan production plant.

15. The process of claim 1, wherein the step of contacting is performed at a hydrogen sulfide to dimethyl sulfide mole ratio of about 10:1, a weight hourly space velocity of about 1.5 g dimethyl sulfide/g cat./hr, and a weight average temperature of about 285° C.

16. The process of claim 2, wherein the step of contacting is performed at a hydrogen sulfide to dimethyl sulfide mole ratio of about 10:1, a weight hourly space velocity of about 1.5 g dimethyl sulfide/g cat./hr, and a weight average temperature of about 285° C.

17. The process of claim 7, wherein the step of contacting is performed at a hydrogen sulfide to dimethyl sulfide mole ratio of about 10:1, a weight hourly space velocity of about 1.5 g dimethyl sulfide/g cat./hr, and a weight average temperature of about 285° C.

18. The process of claim 8, wherein the step of contacting is performed at a hydrogen sulfide to dimethyl sulfide mole ratio of about 10:1, a weight hourly space velocity of about 1.5 g dimethyl sulfide/g cat./hr, and a weight average temperature of about 285° C.

19. The process of claim 9, wherein the step of contacting is performed at a hydrogen sulfide dimethyl sulfide mole ratio of about 10:1, a weight hourly space velocity of about 1.5 g dimethyl sulfide/g cat./hr, and a weight average temperature of about 285° C.

20. The process of claim 10, wherein the step of contacting is performed at a hydrogen sulfide to dimethyl sulfide mole ratio of about 10:1, a weight hourly space velocity of about 1.5 g dimethyl sulfide/g cat./hr, and a weight average temperature of about 285° C.

21. The process of claim 11, wherein the step of contacting is performed at a hydrogen sulfide to dimethyl sulfide mole ratio of about 10:1, a weight hourly space velocity of about 1.5 g dimethyl sulfide/g cat./hr, and a weight average temperature of about 285° C.

22. The process of claim 12, wherein the step of contacting is performed at a hydrogen sulfide to dimethyl sulfide mole ratio of about 10:1, a weight hourly space velocity of about 1.5 g dimethyl sulfide/g cat./hr, and a weight average temperature of about 285° C.

23. The process of claim 14, wherein the step of contacting is performed at a hydrogen sulfide to dimethyl sulfide mole ratio of about 10:1, a weight hourly space velocity of about 1.5 g dimethyl sulfide/g cat./hr, and a weight average temperature of about 285° C.