

CLAIMS

1. A process for the conversion of dimethyl sulfide to methyl mercaptan, comprising:
contacting dimethyl sulfide 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 comprises alumina, NiMo on an alumina support, CoMo on an alumina support, or a combination thereof.
2. The process of claim 1, 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.
3. The process of claim 1, wherein the step of contacting has a conversion of dimethyl sulfide of greater than 50% and a selectivity to methyl mercaptan of greater than 95%.
4. The process of claim 1, further comprising:
separating the reactor effluent into a recycle H₂S stream and a methyl mercaptan stream;
and
recycling the recycle H₂S stream for use in the step of contacting.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.

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10. The process of claim 9, 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 the weight of dimethyl sulfide fed to the reactor.
11. The process of claim 9, 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.
12. The process of claim 1, further comprising:
 - flowing a H₂S stream comprising hydrogen sulfide to the reactor, wherein the hydrogen sulfide in the H₂S 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.
13. 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.
14. The process of claim 13, further comprising:
 - recovering a MeSH product stream comprising methyl mercaptan from the methyl mercaptan production plant, wherein the MeSH product stream further comprises less than about 5 ppmw carbon disulfide based on a total weight of the MeSH product stream.
15. The process of claim 14, 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.
16. 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 H₂S 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 H₂S stream to the methyl mercaptan production plant.

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17. A system comprising:
- a DMS stream comprising dimethyl sulfide received from a methyl mercaptan production plant;
 - a H₂S stream comprising hydrogen sulfide received from the methyl mercaptan production plant;
 - a combined feed stream comprising dimethyl sulfide received from the DMS stream and hydrogen sulfide received from the H₂S stream;
 - a preheater which receives the combined feed stream and yields a heated feed stream comprising the dimethyl sulfide and hydrogen sulfide at a reaction temperature;
 - a reactor receiving the heated feed stream, wherein the reactor contains a catalyst comprising alumina, NiMo on an alumina support, CoMo on an alumina support, or a combination thereof;
 - a reactor effluent stream receiving reactor effluent from the reactor, wherein the reactor effluent comprises methyl mercaptan in an amount of about 5 mole% to about 76 mole% based on the total moles in the reactor effluent stream.
18. The system of claim 17, wherein the reactor effluent is cooled to yield a cooled reactor effluent stream.
19. The system of claim 18, wherein the cooled reactor effluent stream recycles methyl mercaptan and hydrogen sulfide to the methyl mercaptan production plant.
20. The system of claim 19, further comprising:
- a MeSH product stream comprising methyl mercaptan and less than about 5 ppmw carbon disulfide based on a total weight of the MeSH product stream, wherein the methyl mercaptan is recovered from the methyl mercaptan production plant.
21. The system of claim 20, further comprising:
- one or more purge streams comprising equal to or less than about 10 mole% carbon disulfide based on a total moles in the one or more purge streams, wherein the one or more purge streams is recovered from the methyl mercaptan production plant.
22. The system of claim 21, wherein the one or more purge streams comprises dimethyl sulfide in an amount which is less than about 5 wt% based on the weight of dimethyl sulfide in the DMS stream.

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23. The system of claim 18, further comprising:
- a separation vessel, wherein the cooled reactor effluent stream recycles methyl mercaptan and hydrogen sulfide to the separation vessel;
 - an enriched H₂S stream flowing hydrogen sulfide from the separation vessel, wherein the hydrogen sulfide recycles to the methyl mercaptan production plant via in the enriched H₂S stream;
 - and
 - an enriched MeSH stream flowing methyl mercaptan from the separation vessel, wherein the methyl mercaptan recycles to the methyl mercaptan production plant via the enriched MeSH stream.
24. A process comprising:
- utilizing a methyl mercaptan production plant to recover dimethyl sulfide;
 - responsive to a first market condition, contacting at least a portion of the recovered dimethyl sulfide with a CoMo or NiMo catalyst in the presence of hydrogen sulfide in a reactor to yield a reactor effluent comprising methyl mercaptan, hydrogen sulfide, and carbon disulfide;
 - responsive to a second market condition, discontinuing the contacting of the recovered dimethyl sulfide in the reactor; and
 - selling all or a portion of the recovered dimethyl sulfide.