

Patent claims

1. A process for preparing 3-methylthiopropionaldehyde, comprising the steps of
 - 5 a) providing a liquid stream (1) comprising methyl mercaptan and/or the hemi thioacetal formed from 3-methylthiopropionaldehyde and methyl mercaptan,
 - b) providing an acrolein comprising vapor stream (2), wherein the major part of said stream is acrolein, and the pressure of said stream is lower than atmospheric pressure,
 - 10 c) introducing the liquid stream comprising methyl mercaptan and/or the hemi thioacetal formed from 3-methylthiopropionaldehyde and methyl mercaptan of step a) and the acrolein comprising vapor stream of step b) into a reaction unit (4) by means of a vapor-liquid mixing device (3), and
 - 15 d) reacting acrolein with methyl mercaptan and/or the hemi thioacetal formed from 3-methylthiopropionaldehyde and methyl mercaptan in the reaction unit (4) of step c) to give a 3-methylthiopropionaldehyde comprising product mixture.
2. The process according to claim 1, wherein the acrolein comprising vapors stream of step b) contains at least 70 wt.-% of acrolein.
- 20 3. The process according to claim 1 or 2, wherein the pressure of the acrolein comprising vapors stream of step b) ranges from 300 to 950 mbara.
4. The process according to any of claims 1 to 3, wherein the step c) comprises mixing the liquid stream comprising methyl mercaptan and/or the hemi thioacetal formed from 3-methylthiopropionaldehyde and methyl mercaptan of step a) and the acrolein comprising vapor stream of step b) in the vapor-liquid mixing device of step c).
- 25 5. The process according to any of claims 1 to 4, wherein the pressure of the acrolein comprising vapor stream of step b) is generated in the vapor-liquid mixing device of step c) and/or by a vacuum generating device downstream of the reaction unit of step c).
6. The process according to any of claims 1 to 5, wherein the temperature in step d) is higher than the condensation temperature of acrolein in the vapor stream of step b).
- 35 7. The process according to any of claims 1 to 6, wherein the temperature of the liquid stream comprising methyl mercaptan and/or the hemi thioacetal formed from 3-methylthiopropionaldehyde and methyl mercaptan in step d) ranges from 50 to 90°C.

8. The process according to any of claims 1 to 7, wherein the temperature of the acrolein comprising vapor stream in step b) ranges from 20 to less than 50°C.
- 5 9. The process according to any of claims 1 to 8, wherein the liquid stream comprising methyl mercaptan and/or the hemi thioacetal formed from 3-methylthiopropionaldehyde and methyl mercaptan of step a) also comprises a solvent having a boiling temperature which is at least 20°C higher than the boiling temperature of acrolein.
- 10 10. The process according to any of claims 1 to 9, wherein the process further comprises the steps of
- 15 e1) scrubbing acrolein and/or methyl mercaptan, if contained in the off-gas from the reaction of step d), with a solvent having a boiling temperature which is at least 20°C higher than the boiling temperature of acrolein, to give an acrolein and/or methyl mercaptan comprising liquid stream, and
- e2) feeding the acrolein and/or methyl mercaptan comprising liquid stream obtained in step e1) to step c) and/or to step d).
- 20 11. The process according to any of claims 1 to 10, wherein the liquid stream comprising methyl mercaptan and/or the hemi thioacetal formed from 3-methylthiopropionaldehyde and methyl mercaptan of step a) also comprises a solvent, wherein said solvent is 3-methylthiopropionaldehyde.
- 25 12. The process according to any of claims 1 to 11, wherein the process further comprises the further comprises the steps
- 30 f1) withdrawing a 3-methylthiopropionaldehyde comprising product mixture obtained in step d) as 3-methylthiopropionaldehyde comprising stream from the reaction unit,
- f2) feeding the complete or at least a part of the 3-methylthiopropionaldehyde comprising stream from step f1) to a heat exchanger to provide a tempered 3-methylthiopropionaldehyde comprising stream, and
- 35 f3) feeding a part of the tempered 3-methylthiopropionaldehyde comprising stream of step f2) to the reaction unit (4) or mixing a part of the tempered 3-methylthiopropionaldehyde comprising stream of step f2) with methyl mercaptan and/or the hemi thioacetal formed from 3-methylthiopropionaldehyde and methyl mercaptan to provide the methyl mercaptan comprising liquid stream (1).
13. The process according to claim 12, wherein the 3-methylthiopropionaldehyde comprising stream is tempered in step f2) to a temperature in the range from 20 to 40°C.

14. The process according to any of claims 1 to 10, wherein, when the liquid stream comprising methyl mercaptan and/or the hemi thioacetal formed from 3-methylthiopropionaldehyde and methyl mercaptan of step a) contains a solvent which is different from 3-methylthiopropionaldehyde, the process further comprises the step of separating said solvent from the 3-methylthiopropionaldehyde comprising product mixture obtained from step d).
15. The process according to any of claims 1 to 14, wherein the molar ratio of methyl mercaptan and/or the hemi thioacetal formed from methyl mercaptan and 3-methylthiopropionaldehyde to acrolein in step c) and/or d) is less than 1.