DESCRIPTION

TITLE: **METHOD FOR PREPARING METHYL MERCAPTAN WITH TREATMENT OF GASEOUS WASTE**

The present invention relates to a process for producing methyl mercaptan incorporating treatment of the gaseous discharges. The present invention also relates to a process for treating the gaseous discharges from a methyl mercaptan production unit.

Mercaptans are of great interest industrially and are currently in widespread use in the chemical industries, notably as starting materials in the synthesis of more complex organic molecules. For example, methyl mercaptan (CH_3SH or MeSH) is used as a starting material in the synthesis of methionine, an essential amino acid for animal nutrition. Methyl mercaptan is also used in the synthesis of dialkyl disulfides, in particular in the synthesis of dimethyl disulfide (DMDS), a sulfiding additive for hydrotreating catalysts for petroleum fractions, among other applications.

The industrial synthesis of methyl mercaptan may take place according to “the methanol route”, starting with methanol and hydrogen sulfide according to the following reaction (1):

$$CH_3OH + H_2S \rightarrow CH_3SH + H_2O \qquad (1)$$

Reaction (1) is usually performed in the gas phase with H_2S in excess. Also, at the industrial level, gaseous discharges (also called gaseous vents) may be emitted throughout the production process. These discharges are usually treated by incineration. However, they include a very high concentration of H_2S whose combustion during incineration will lead to high emissions of sulfur dioxide into the atmosphere (SO_2 is a pollutant and irritant gas, which can be responsible for acid rain). Furthermore, this loss of H_2S increases the variable production costs of methyl mercaptan and leads to a decrease in productivity.

There is thus a need for a process for producing methyl mercaptan which is more environmentally friendly and more economical. There is also a need to reduce the gaseous discharges, and notably the sulfur dioxide, emitted during the production of methyl mercaptan.

One object of the present disclosure is to provide a process for preparing methyl mercaptan which allows improved management of the gaseous discharges, and which is notably more environmentally friendly.

One object of the present disclosure is to reduce the gaseous discharges, and notably the amount of sulfur dioxide, emitted during the production of methyl mercaptan.

Another object of the present disclosure is to provide a process for preparing methyl mercaptan, which is more economical.

Another object of the present disclosure is to provide a process and/or a device for treating gaseous discharges, which can be readily integrated into a unit for producing methyl mercaptan, notably via the methanol route.

The present disclosure meets all or some of the abovementioned objectives.

The present inventors have discovered, surprisingly, that the gaseous discharges can be recovered and treated by gas-liquid extraction. The gas(vent gases)-liquid(methanol) extraction according to the disclosure makes it possible notably to pass the sulfur compounds contained in said gaseous vents into the liquid methanol. The term “sulfur compounds” means compounds which comprise at least one sulfur atom, preferably 1 or 2 sulfur atoms. In particular, the term “sulfur compounds” means H_2S, methyl mercaptan and sulfur byproducts such as dimethyl sulfide (DMS) and dimethyl disulfide (DMDS).

Thus, the gas-liquid extraction according to the disclosure makes it possible to recover at least one sulfur compound, preferably H_2S, in methanol. In particular, the gas-liquid extraction according to the disclosure makes it possible to recover the H_2S and methyl mercaptan in methanol.

Very advantageously, said methanol enriched in sulfur compound(s) can be used, preferably used directly (for example without a purification step), as a reagent for forming methyl mercaptan. Thus, the present disclosure makes it possible to reintroduce into the production process the H_2S and possibly the methyl mercaptan from the vent gases which were hitherto incinerated.

Furthermore, said extraction allows the inert compounds to pass (i.e. the inert compounds hardly pass from the vent gases into the methanol but remain in the gas phase). This avoids their accumulation in the installations and thus blockages and the resulting safety problems. In particular, hydrogen (H_2), does not pass into the methanol, which avoids undesirable methanation reactions in the reactor when enriched methanol is used as a reagent in the production of methyl mercaptan. These reactions are notably the following:

$CH_3OH + H_2 \rightarrow CH_4 + H_2O$ and $CH_3SH + H_2 \rightarrow CH_4 + H_2S$.

It is understood that the extraction according to the disclosure is not intended to recover the sulfur compounds, and in particular the unreacted H_2S, directly from the outlet of

the reactor for the production of methyl mercaptan from methanol and H_2S. The extraction according to the disclosure is also not aimed at the recovery or recycling of the majority of the unreacted H_2S. The process according to the disclosure is directed toward recovering the sulfur compounds present in the gaseous vents, which are usually incinerated and responsible for the release of sulfur dioxide.

Thus, the process according to the disclosure notably does not involve an amount of methanol for said extraction greater than the amount of methanol required for the synthesis of the methyl mercaptan. On the contrary, the extraction according to the disclosure can easily be integrated into a methyl mercaptan production unit since it treats only the gaseous vents. It therefore consumes little energy and uses a simple device.

Said extraction also makes it possible to reduce the amount of vent gases to be treated by incineration and makes it possible to greatly reduce the release of sulfur dioxide into the atmosphere.

The process for producing methyl mercaptan according to the disclosure is thus more economical and has better productivity, while at the same time being more environmentally friendly.

In an aspect, the present disclosure relates to a process for producing methyl mercaptan, comprising the following steps:

A) methanol is reacted with hydrogen sulfide to form a stream (M), preferably in gaseous form, comprising methyl mercaptan, unreacted H_2S and possibly sulfur byproducts;

B) optionally, said stream (M) is condensed;

C) at least one step of purification of said stream (M) is performed to obtain a stream enriched in methyl mercaptan;

D) the gaseous vents resulting from said at least one purification step are recovered, said gaseous vents comprising at least one sulfur compound, preferably H_2S;

E) a gas-liquid extraction of said at least one sulfur compound (present in said vent gases), preferably H_2S, is performed with liquid methanol so as to obtain a liquid methanol enriched in sulfur compound(s), preferably in H_2S; and

F) optionally, said enriched methanol is used as reagent for the reaction of step A).

In particular, the gaseous vents comprise H_2S, methyl mercaptan and possibly sulfur byproducts so as to obtain, following step E), a methanol enriched in H_2S, methyl mercaptan and possibly sulfur byproducts.