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PROCESS OF PREPARING ACETALDEHYDE

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3 Claims. (Cl. 260—139)

The present invention relates to a process of preparing acetaldehyde.

In the processes hitherto known for preparing acetaldehyde from acetylene by introducing acetylene into aqueous solutions of strong acids, particularly sulfuric acid, in the presence of a mercury compound, the transformation into acetaldehyde in unit time is a maximum when the process is conducted at temperatures of between 50° C. and 80° C.

The lower the temperature used, the more difficult it becomes to eliminate from the liquid the acetaldehyde which has been formed by the reaction. It has been found that a resinification easily occurs if care is not taken immediately to expel the aldehyde. This resinification is more liable to occur the lower the reaction temperature. For this reason, particularly if a low temperature, such as 50° C. or 60° C. is used, the liquid containing the catalyst quickly becomes useless on account of the formation of mud. This inconvenience has been remedied in known processes in different manners, for instance by causing a large excess of acetylene to circulate vigorously through the apparatus so that the aldehyde of low boiling point is carried away. At temperatures above 85° C., for instance between 85° C. and 90° C. or 100° C., or at the boiling temperature of the liquid containing the catalyst, the transformation occurs more slowly; but this process has the advantage of giving a superior yield, even a nearly quantitative yield, that is to say of decreasing the proportion of acetylene or of aldehyde lost by the resinification. A process permitting these high working temperatures is already known by the investigations of Erdmann and Köthner (see "Zeitschrift für anorganische Chemie" 18, page 56, and "Chemiker Zeitung" 1898, page 869), but this process has the inconvenience mentioned above that the transformation is relatively slow.

We have now found that the reaction can be considerably accelerated also at these high temperatures by increasing the concentration of the gas within the reaction liquid, that is by working under a super pressure. Furthermore it is advantageous to cause a current of acetylene in excess to circulate through the reaction liquid.

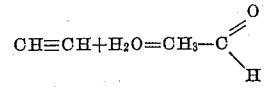
By working with an acetylene gas of high percentage strength, the use of pressure is limited by the fact that the acetylene easily decomposes with explosion at a super pressure of more than 2 atmospheres over the normal atmospheric pressure. However, a super-pressure of about 1 or 1.5 atmospheres over the normal atmospheric pressure may be used without danger. It has been found that the combined utilization of a temperature between 85° C. and the boiling point of the solution containing the catalyst of a superpressure of 1–1.5 atmospheres over the normal atmospheric pressure and of the circulation of acetylene in excess produces a surprising effect because not only a rapid transformation is obtained, but also a nearly quantitative yield. Moreover, the contact liquid possesses also a high stability; it has to be renewed or regenerated only after a considerable length of time, because, on account of the great volatility of the aldehyde at these temperatures, decomposition or resinification is nearly completely avoided.

This process may be a continuous one. For this purpose a fresh solution of the catalyst is continuously introduced at the part of the reaction vessel where the gas current enters, taking care that a corresponding quantity of the liquid is continuously removed so that the quantity of the liquid always remains constant. The liquid removed may be regenerated according to one of the known methods and returned to the apparatus.

The gas current carries away the aldehyde formed and the water vapor. The aldehyde is then isolated according to known methods, for instance by a refrigerator or a washer, and the excess of gas is passed either into another reaction vessel or, in the cycle of the process, into the same vessel.

The following example illustrates the invention, but is not intended to limit it thereto:

Into a reaction tower, which has been fed with hot, diluted sulfuric acid still containing some mercury compounds and oxidizing agents, such as ferric sulfate, there is blown a strong current of acetylene which was compressed to a superpressure of about 1.4 atmospheres over the normal atmospheric pressure. From the waste gases leaving the tower the acetaldehyde obtained is isolated according to known methods; the excess of acetylene is then reconducted into the acetylene compressor. The reaction which takes place according to the following equation



is suitably carried out in such a manner, that not too much acetylene in excess circulates through the tower, in order to avoid a cooling of the reaction liquid. According to the pressure which is exerted upon the liquid, the tem-

perature is adjusted to about 85° C.–95° C. The process is made continuous by causing a fresh liquid containing the catalyst always to enter at the lower part of the tower, and the used liquid to leave the tower at the upper part. Thus nearly theoretical yields of acetaldehyde are obtained.

We claim:

1. In the process of preparing acetaldehyde from acetylene while employing a mercury compound catalyst in an acid aqueous solution, the improvement which comprises introducing concentrated acetylene in excess under a pressure of from 1 to 1.5 atmospheres over the normal atmospheric pressure into said catalytic solution at a temperature between 85° C. and the boiling point of said solution in the absence of an added organic solvent for the acetylene.

2. The process as defined in claim 1 wherein the temperature employed is one within the range of between 85 and 95° C.

3. In the process of preparing acetaldehyde from acetylene while employing a mercury compound catalyst in an acid aqueous solution, the improvement which comprises introducing concentrated acetylene in excess under a pressure of from 1 to 1.5 atmospheres over the normal atmospheric pressure into said catalytic solution at a temperature between 85° C. and the boiling point of said solution in the absence of an added organic solvent for the acetylene and introducing a fresh solution of the catalyst continuously into the reaction mixture while a corresponding quantity of the solution is continuously removed therefrom.

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