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(54) MANUFACTURE OF ACETONE

(54) FABRICATION D'ACETONE

(57) **Abstract:**

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This invention relates to an improved process for the manufacture of acetone from acetic acid, and the object of the invention is to provide for the production of acetone in a continuous, simple and inexpensive manner.

A further object is to provide for a high yield of acetone in a very pure form.

The process previously employed for the manufacture of acetone, consisted in decomposing calcium acetate in iron vessels, by the action of heat. It therefore is necessary for this process to previously prepare calcium acetate from diluted acetic acid, or from pyroligneous acid. This operation is long and involved, the acetone prepared is very impure and the yields are low.

A number of patents have previously been issued describing the preparation of acetone directly from pyroligneous acid, by passing this latter material over catalysts heated to a suitable temperature.

The present invention relates to the preparation of acetone using acetic acid of a higher concentration than that known as pyroligneous acid. It relates more particularly to acetic acid as obtained from acetylene, but is applicable to any concentration of acetic acid.

In previous patents relating to the manufacture of acetone, acid in the form of vapor is passed through tubes filled with pumice or coke coated with the catalyst. This method is found to be entirely impracticable, due to the fact that such material as pumice and coke are non-conductors of heat and the resultant product only contains a small amount of acetone, together with other decomposition products of acetic acid, such as methane; the low yields and decomposition products being primarily due to too high a wall temperature of the tube and to too low temperature of the catalyst-carrying material, viz., the coke or

...ice, etc.

The present process depends for its success on the use in the tubes of a heat-conducting material, such as metal balls or other form of material of good conductivity, on which the catalyst is placed in the form of a coating. The process, therefore, broadly consists of vaporixing acetic acid and passing it through tubes heated to a temperature ranging between 375° and 525° C. and filled with metal balls of one to two inches diameter, these balls being coated with the catalyst. The prime requirements of the catalyst are, firstly, that it shall serve to convert acetic acid into acetone, and secondly, that it will adhere to the metallic surfaces. All these requirements are met with in the use of lime alone, or a mixture of lime and magnesia. It is further necessary for efficient operation to secure as large a surface of catalyst exposed to the acid as possible.

The following example will give a more thorough understanding of the process:-

Acetic acid of concentration of from 5% to 100% is vaporized preferably by steam heat and the acetic acid vapor thus produced is passed into a steel tube having suitable heating means. The tube itself is filled with steel balls coated with the catalyst. This catalyst is a mixture formed by mixing lime 75% to 95%, magnesia 25% to 5%, with water, to form a heavy paste. The balls are dipped in this paste and dropped into the tube. The tube is now heated and a current of air passed through the same to remove the moisture from the catalyst. The temperature is then raised to approximately 500° C., and the acetic acid vapor passed through. Under these conditions, acetic acid decomposes readily into acetone, carbon dioxide and water vapor. This gaseous product is then passed through

condensers cooled by running water, which condenses the water vapor and the major portion of the acetone. The gas escaping from the condensers, consisting of carbon dioxide mixed with acetone vapor, is passed through a water scrubbing column to remove the last traces of acetone. The acetone obtained from the condenser and that obtained from the scrubber is then rectified in suitable rectifying equipment, which gives a very pure grade of acetone. The yield obtained from this process, as outlined above, is very high, ranging from 85% to 95% of the theoretical amount. The quality of the product is also so good that but little purification is required in the stills.

This process, as outlined, can be continued for a considerable period without deterioration of the catalyst. However, the current of gas passing through the tubes, together with the heat applied to the steel balls, causes the catalyst to become loosened in time from the balls and at stated intervals of from two to three weeks the catalyst requires to be renewed. This, however, involves but little expense and the process is practically continuous.

While the use of steel balls only is outlined above, any other catalytic material may be used or any body in general, having a heat conductivity comparable with iron.

While the foregoing example outlines only the use of lime and magnesia as catalyst, it is to be further understood that the invention is not limited to this, as any oxide, hydroxide, carbonate or acetate of any of the elements may be used, the acetates of which are capable of conversion into acetone by the action of heat.

A further advantage of the use of this process

is the easy control of the temperature of the tubes, the heat capacity of the steel shell and of the balls being so great that fluctuations are extremely slow and easily regulated. This control may be further facilitated by winding the tubes with an electric resistance so that the heat may be easily regulated. The amount of heat may be greater at the ends of the tubes where the acid enters, in order to expedite the action.

It is further understood that instead of a steel tube, one of copper, aluminum, silver, etc. may be used, and the method of heating the same is not confined to electric heating but they may be heated by any other method, such as the use of hot gases, crude oil, etc.

Further, the acetic acid vapor may be preheated in any suitable manner before passing same into conversion tube. If it is preheated to 250° to 300° C., the capacity of the tube per square foot catalytic surface is greatly increased.

If it is found that unchanged acetic acid is emerging from the tubes along with the acetone, the vapors may be passed through scrubbers which will absorb the acetic acid but will permit the acetone to pass through unaffected. Scrubbers charged with an alkaline solution such as caustic soda solution have been found suitable for the purpose. The acetic acid combines with the caustic soda to form sodium acetate.

Having thus described my invention, what I claim is;-

1.- In the manufacture of acetone by passing acetic acid vapor over a catalyst, the use of a multitude of separate metallic bodies of substantially the same size and shape as a catalyst carrier and heat conductor.

2.- A process according to claim 1, in which the bodies are shaped to produce spaces between themselves substantially equal in size and shape, whereby the acid vapor will circulate with equal facility through all parts of the mass of bodies.

3.- A process according to claim 1, in which the bodies have continuously curved surfaces.

4.- A process according to claim 1, in which the bodies are substantially spherical.

5.- A process according to claim 1, in which the bodies are composed of metal of the iron family.

SUBSTITUTE

REMPLACEMENT

SECTION is not Present

Cette Section est Absente