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PROCESS FOR THE MANUFACTURE OF KETONES

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8 Claims. (Cl. 260—134)

This invention relates to improvements in catalysts used for dehydrogenation of secondary alcohols to form ketones.

Vapors of secondary alcohols, either with or without admixtures of air or other oxygen-containing gases, when passed over heated brass at temperatures ranging from 500° C. to 800° C. give off hydrogen, whereby the secondary alcohols are converted into the corresponding ketones. The brass used for this reaction is an alloy of 10 to 33% of zinc with 90 to 67% of copper. Other metals may be incorporated in the brass. The brass is used in the form of turnings in order to have a larger surface for contacting with the vapors.

According to this invention it has been discovered that where about two per cent or less of magnesium metal is incorporated in the brass alloy, larger yields of ketones are obtained, the catalysts will be active over a longer period of time, and lower temperatures may be used in the manufacture of the ketones from the secondary alcohols.

To illustrate the invention, the preferred procedure is as follows:

Secondary alcohols or mixtures thereof, which may contain small percentages of water, are vaporized in a closed vessel. The vapors are passed through a reaction chamber maintained at a temperature of 300° C. to 600° C. Hydrogen is liberated, and ketones are formed. The reaction chamber may be of any desired material, such as an alloy that is highly resistant to corrosion, and can be maintained at elevated temperatures of prolonged periods of time without deterioration. In the reaction chamber, the catalyst, which is generally in the form of turnings, is uniformly packed to prevent channeling. The preferred composition of the catalyst used is that containing .5% to 2% magnesium, 34% to 35% zinc and 63% to 64.5% copper. The reaction products coming from the chamber are then passed through a condenser, and the uncondensed gas which is largely hydrogen, is scrubbed with oil to remove the entrained liquid. The condensate is purified by washing with caustic soda solution and fractionally distilled. By this process isopropyl, secondary butyl, secondary amyl, secondary hexyl alcohol and other alcohols containing the =CHOH group can be converted to ketones by the use of this catalyst at temperatures of about 470° C. to 510° C.

The space-time-yield is approximately 1 to 1.5 by the formula

$$\text{Space-time-yield}=F\left(\frac{V}{Vc}\right)$$

Where, F=Fractional conversion
V=Volume of material passing through catalyst expressed as liquid
Vc=Volume of catalyst

Example

50 gallons of secondary butyl alcohol is passed through a catalyst mass of 40 gallons. An 85% conversion of this alcohol to methyl ethyl ketone is thereby obtained.

$$\text{The space-time-yield}=.85\left(\frac{50}{40}\right)=106.$$

This figure varies considerably through the range given, but this range represents approximate equilibrium conditions.

It is believed that activity of the brass alloy containing magnesium may be largely due to the mechanical state of the surface of the brass. Magnesium makes the brass alloy brittle, thus producing a rough surface when the turnings are run off on a lathe. No special technique is required to produce turnings of the correct size and shape. This theory is not to be considered binding as to the invention, as the use of a special alloy is claimed which produces a large yield of ketones from secondary alcohols at lower temperatures, and accordingly the claims are limited to the use of the alloy.

It has also been found that Mg brass will remain active over a longer period of time, about 25% longer, than where Zn-Cu brass is used. Therefore, better yields are obtained due to less breakdown, etc.

It is not desired to be limited by any of the specific examples given, or any of the theories of the operation of the invention which have been advanced, but it is intended to claim all inherent novelty in the invention as broadly as the prior art permits.

I claim:

1. The improved process for dehydrogenation of aliphatic secondary alcohols to produce ketones which comprises subjecting the vapors of

aliphatic secondary alcohols to a catalyst consisting essentially of copper, zinc and magnesium.

2. The improved process for the manufacture of ketones which comprises subjecting the vapors of aliphatic secondary alcohols to a catalyst consisting essentially of copper, zinc and a smaller amount of magnesium.

3. The improved process for manufacturing ketones from alcohols which comprises passing the vapors of an aliphatic secondary alcohol over a metallic catalyst comprising a major proportion of copper and zinc and a minor proportion of magnesium serving to promote the catalytic activity of said catalyst.

4. The improved process for manufacturing ketones from secondary alcohols which comprises passing the vapors of an aliphatic secondary alcohol over a catalyst comprising essentially copper and zinc with a small amount of magnesium at a dehydrogenating temperature of 300° to 600° C.

5. The improved process of manufacturing methyl ethyl ketone which comprises subjecting vapors of a secondary butyl alcohol to the action of a catalyst comprising essentially copper and zinc with a small amount of magnesium at a dehydrogenating temperature.

6. An improved process for producing acetone which comprises passing vapors of isopropyl alcohol over a catalyst, comprising essentially copper and zinc with a small amount of magnesium at dehydrogenation temperature.

7. Process according to claim 4, in which a catalyst of the following composition is used, 63 to 64½% copper; 34 to 35% zinc; and .5 to 2% magnesium.

8. Process according to claim 3 which is carried out in the presence of an oxygen containing gas.

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