produce methyl acetate. Carbonylation processes of this type are known from, for example US 7,465,822, WO 2008/132441 and WO 2008/132438. However, it has now been found that operation of such processes can result in crude product streams which are sub-optimal for direct utilisation in co-production processes of the type described above and in particular, those crude product streams which comprise significant amounts of dimethyl ether, such as crude product streams formed in carbonylation processes operated under low carbon monoxide partial pressure conditions.

Furthermore, direct utilisation of crude methyl acetate feed streams containing fairly high levels of dimethyl ether in co-production processes of the type described above has been found to inhibit the formation of dimethyl ether product and/or acetic acid product. This disadvantage may be further exacerbated by the use of commercial methanol sources which typically contain dimethyl ether and in amounts which may be in excess of 25 mol%.

Thus, there remains a need for an improved process for the co-production of acetic acid and dimethyl ether from methanol and methyl acetate streams which process has improved conversion to at least dimethyl ether product, and in particular an improved process for the co-production of acetic acid and dimethyl ether from methanol and methyl acetate streams derived from processes for the carbonylation of dimethyl ether with carbon monoxide in the presence of a carbonylation catalyst.

Summary

In an aspect, there is provided a process for the co-production of acetic acid and dimethyl ether by dehydration-hydrolysis of a feed mixture of methanol and methyl acetate in the presence of at least one catalyst to generate a crude reaction product comprising acetic acid and dimethyl ether wherein the feed to said co-production process comprising methanol and methyl acetate comprises dimethyl ether in a total amount of 25 mol% or less based on the total feed.

Detailed Description

Accordingly, the present invention provides a process for the co-production of acetic acid and dimethyl ether by dehydration-hydrolysis of a feed mixture of methanol and methyl acetate in the presence of at least one catalyst to generate a crude reaction product comprising acetic acid and dimethyl ether wherein the feed to said co-production

process comprising methanol and methyl acetate comprises dimethyl ether in a total amount of 25 mol% or less based on the total feed.

In preferred embodiments of the present invention, the feed for the co-production process has a total dimethyl ether content of 15 mol% or less, for example 10 mol% or less, preferably 5 mol% or less.

In one or more embodiments of the present invention the methyl acetate feed for the co-production process comprises methyl acetate and dimethyl ether. Suitably, the methyl acetate feed is derived from a crude methyl acetate stream produced in processes for the carbonylation of dimethyl ether with carbon monoxide in the presence of a

Claims:

1. A process for the co-production of acetic acid and dimethyl ether by dehydration-hydrolysis of a feed mixture of methanol and methyl acetate in the presence of at least one catalyst to generate a crude reaction product comprising acetic acid and dimethyl ether wherein the feed to said co-production process comprising methanol and methyl acetate comprises dimethyl ether in a total amount of 25 mol% or less based on the total feed.

2. A process according to claim 1 wherein the feed to the co-production process comprises methyl acetate in an amount of from 10 to 95 mol%, dimethyl ether in an amount of from 0.1 to 25 mol%, methanol in an amount of 5 to 20 mol% and contaminants in a total amount of 0 to less than 1 mol%.

3. A process according to claim 2 wherein the contaminants are selected from one or more of acetaldehyde, acetone and methyl formate

4. A process according to claim 2 or claim 3 wherein the feed comprises dimethyl ether in an amount of 0.1 to 5 mol%.

5. A process according to claim 2 or claim 3 wherein the feed further comprises water.

6. A process according to any one of claims 1 to 5 wherein the methyl acetate feed comprises dimethyl ether and is derived from a crude methyl acetate stream produced in processes for the carbonylation of dimethyl ether with carbon monoxide in the presence of a carbonylation catalyst to produce a crude methyl acetate stream comprising dimethyl ether which crude methyl acetate stream is treated to reduce its dimethyl ether content to provide a methyl acetate feed to the co-production process which comprises dimethyl ether in an amount of >0 to 25 mol%.

7. A process according to claim 6 wherein the treated crude methyl acetate comprises dimethyl ether in an amount of >0 to 5 mol%.

~~8. A process according to claim 6 or claim 7 wherein the carbonylation catalyst is a zeolite carbonylation catalyst.~~

~~9~~8. A process according to ~~any one of~~ claim~~s~~ 6 ~~to 8~~ or claim 7 wherein ~~in the process for the carbonylation of dimethyl ether the conversion of~~ the crude methyl acetate comprises dimethyl ether ~~to methyl acetate is~~ in an amount of 5 to 50 mol%~~the range 5 to 90%~~.

9. A process according to claim 8 wherein the crude methyl acetate further comprises contaminants in a total amount of up to 1 mol%.

10. A process according to any one of claims 6 to 9 wherein the crude methyl acetate is treated to reduce its ~~comprises~~ dimethyl ether content by distillation. ~~in an amount of 5 to 50 mol%.~~

~~11. A process according to claim 9 wherein the crude methyl acetate further comprises contaminants in a total amount of up to 1 mol%.~~

~~12. A process according to any one of claims 6 to 11 wherein the crude methyl acetate is treated to reduce its dimethyl ether content by distillation.~~

~~13. A process according to claim 12 wherein distillation of the crude methyl acetate is carried out by fractional distillation in a distillation column wherein~~

~~(i) dimethyl ether is recovered as a heads stream from the column; and~~

~~(ii) methyl acetate is recovered as a base stream from the column; and which base stream or a part thereof is utilised as a methyl acetate feed to the co-production process.~~

~~14. A process according to claim 12 or claim 13 wherein the crude methyl acetate is distilled together with a methanol stream comprising methanol and methyl formate.~~

~~15. A process according to claim 13 or claim 14 wherein the base stream comprises contaminants in a total amount of 1 mol% or less.~~

~~16~~11. A process according to ~~any one of claims 12 to 15~~claim 10 wherein the distillation is carried out at a pressure of from 10 to 30 barg (1000 to 3000kPa) and a heads temperature of 40 to 90 °C.

~~17~~12. A process according to any one of claims 1 to ~~16~~11 wherein at least one catalyst for the co-production process is a solid acid catalyst.

~~18~~13. A process according to claim ~~17~~12 wherein the solid acid catalyst is a zeolite catalyst.

~~19~~14. A process according to any one of claims 1 to ~~18~~13 wherein the co-production process is carried out at a temperature in the range 100 to 350 °C and at a pressure selected from atmospheric and pressures greater than atmospheric.

~~20. A process according to claim 1 wherein methyl acetate and methanol are supplied as separate feeds to the co-production process.~~

~~21~~15. A process according to any one of ~~the preceding~~ claims 1 to 14 which further comprises recovering dimethyl ether from the crude reaction product comprising acetic acid and dimethyl ether.

~~22~~16. A process according to claim ~~21~~15 wherein recovered dimethyl ether, or a part thereof, is utilised as a feed to a carbonylation process in which dimethyl ether is carbonylated with carbon monoxide in the presence of a carbonylation catalyst to produce a crude methyl acetate.

~~23~~17. A process according to any one of claims 1 to ~~22~~16 wherein acetic acid is recovered from the crude reaction product comprising acetic acid and dimethyl ether.

~~24~~18. A process according to claim 1 wherein the co-production process forms part of an integrated process which integrated process comprises carbonylating dimethyl ether with a carbon monoxide-containing gas in the presence of a zeolite carbonylation catalyst wherein the degree of conversion of dimethyl ether is 5 to 90 mol% per pass based on the total feed to carbonylation to produce a crude carbonylation product comprising methyl acetate and dimethyl ether, recovering from the crude carbonylation product a crude methyl acetate stream comprising methyl acetate and dimethyl ether, treating the crude methyl acetate stream, or part thereof, to recover a stream comprising mainly dimethyl ether and a stream comprising methyl acetate and a reduced amount of dimethyl ether and wherein the stream, or a part thereof, comprising methyl acetate and a reduced amount of dimethyl ether which is an amount of >0 to 25 mol% based on the total feed to the process, is utilised as a feed to the co-production process.

~~25~~19. A process according to any one of claims 1 to ~~24~~18 wherein the co-production process is operated as a continuous process.