CLAIMS

1. A process for treating a zeolite catalyst for the carbonylation of dimethyl ether to produce methyl acetate wherein the catalyst is contacted with a treatment gas comprising water vapour in an amount of at least 1 mol% and at a temperature below which dealumination of the zeolite structure occurs and wherein the zeolite contains at least one channel which is defined by an 8-member ring.

2. A carbonylation process comprised of contacting dimethyl ether with carbon monoxide in the presence of a zeolite catalyst to produce methyl acetate reaction product, wherein the catalyst has been treated by the process of claim 1.

3. A process for the production of methyl acetate by the carbonylation of dimethyl ether with carbon monoxide in the presence of a treated zeolite catalyst wherein the process comprises the steps

(i) contacting a zeolite catalyst with a treatment gas comprising water vapour in an amount of at least 1 mol% and at a temperature below which dealumination of the zeolite structure occurs and wherein the zeolite contains at least one channel which is defined by an 8-member ring; and

(ii) ceasing contact of the catalyst with the water vapour; and

(iii) contacting the treated catalyst with dimethyl ether and carbon monoxide to produce methyl acetate reaction product.

4. A process according to any one of the preceding claims wherein the zeolite is of a framework type selected from the group consisting of MOR, FER, OFF and GME.

5. A process according to claim 4 wherein the zeolite is of framework type MOR and is mordenite.

6. A process according to claim 5 wherein the mordenite is in the hydrogen form.

7. A process according to any one of the preceding claims wherein the zeolite in addition to silicon and aluminium comprises a trivalent framework modifier element selected from one or more of boron, gallium and iron.

8. A process according to any one of the preceding claims wherein the catalyst is in the form of a composite comprising the zeolite and an inorganic oxide binder selected from aluminas, silica-aluminas and silicas.

9. A process according to any one of the preceding claims wherein the catalyst is contacted with the treatment gas at a temperature of from 200 °C to 350 °C.

10. A process according to claim 9 wherein the temperature is from 250 C to 310 °C.

11. A process according to claim 10 wherein the temperature is from 285 °C to 300 °C.

12. A process according to any one of the preceding claims wherein the treatment gas comprises from 1 to 10 mol% water vapour.

13. A process according to claim 12 wherein the treatment gas comprises from 2 to 10 mol% water vapour.

14. A process according to any one of the preceding claims wherein the treatment gas further comprises at least one component selected from one or more of carbon monoxide, hydrogen and dimethyl ether.

15. A process according to any one of the preceding claims wherein the treatment gas further comprises synthesis gas.

16. A process according to claim 15 wherein the synthesis gas has a molar ratio of carbon monoxide to hydrogen of from 15:1 to 1:3.

17. A process according to claim 16 wherein the molar ratio is 4:1 to 1:1.

18. A process according to any one of the preceding claims wherein the catalyst is contacted with the treatment gas for a period of from 10 minutes to 24 hours.

19. A process according to any one of the preceding claims wherein the catalyst is contacted with the treatment gas at a pressure in the range of from 10 to 100 barg.

20. A process according to any one of the preceding claims wherein the catalyst is contacted with the treatment gas at a gas hourly space velocity in the range 3000 to 10,000 h^{-1}.

21. A process according to any one of claims 3 to 20 wherein dimethyl ether is added to a treatment gas subsequent to commencing contact of the catalyst with the treatment gas but prior to ceasing contact of the catalyst with the water vapour.

22. A process according to claim 21 wherein dimethyl ether is added to the treatment gas for up to 1 minute to 1 hour prior to ceasing contact of the catalyst with water vapour.

23. A process according to claim 21 or claim 22 wherein dimethyl ether is added to the treatment gas at a concentration in the range 0.1 to 20 mol% based on the total components of the treatment gas.

24. A process according to claim 23 wherein the dimethyl concentration is in the range 1.5 to 5 mol% based on the total components of the treatment gas.

25. A process according to any one of claims 3 to 24 wherein in step (iii) a synthesis gas is employed as the source of carbon monoxide.

26. A process according to any one of claims 3 to 25 wherein step (iii) is carried out at a temperature of from 250 °C to 350 °C and at a total pressure of from 10 to 100 barg.

27. A process according to any one of claims 3 to 26 wherein methyl acetate is recovered from the reaction product and some or all of the recovered methyl acetate is converted to acetic acid.

CLAIMS

1. A process for treating a zeolite catalyst for the carbonylation of dimethyl ether to produce methyl acetate wherein the catalyst is contacted with a treatment gas comprising water vapour in an amount of at least 1 mol% and at a temperature below which dealumination of the zeolite structure occurs.

2. A zeolite catalyst that provides improved catalytic performance for the carbonylation of dimethyl ether to produce methyl acetate wherein the catalyst is contacted with a treatment gas comprising water vapour in an amount of at least 1 mol% and at a temperature below which dealumination of the zeolite structure occurs.

3. A carbonylation process comprised of contacting dimethyl ether with carbon monoxide in the presence of a zeolite catalyst to produce methyl acetate reaction product, wherein the catalyst has been treated by the process of claim 1.

4. A process for the production of methyl acetate by the carbonylation of dimethyl ether with carbon monoxide in the presence of a treated zeolite catalyst wherein the process comprises the steps

(i) contacting a zeolite catalyst with a treatment gas comprising water vapour in an amount of at least 1 mol% and at a temperature below which dealumination of the zeolite structure occurs; and

(ii) ceasing contact of the catalyst with the water vapour; and

(iii) contacting the treated catalyst with dimethyl ether and carbon monoxide to produce methyl acetate reaction product.

5. A process according to any one of the preceding claims wherein the catalyst is a zeolite which contains at least one channel which is defined by an 8-member ring.

6. A process according to claim 5 wherein the zeolite is of a framework type selected from the group consisting of MOR, FER, OFF and GME.

7. A process according to claim 6 wherein the zeolite is of framework type MOR and is mordenite,

8. A process according to claim 7 wherein the mordenite is in the hydrogen form.

9. A process according to any one of the preceding claims wherein the catalyst is in the form of a composite comprising the zeolite and an inorganic oxide binder selected from aluminas, silica-aluminas and silicas.

10. A process according to any one of the preceding claims wherein the catalyst is

contacted with the treatment gas at a temperature of from 200 °C to 350 °C

11. A process according to claim 10 wherein the temperature is from 250 C to 310 °C.

12. A process according to claim 11 wherein the temperature is from 285 °C to 300 °C.

13. A process according to any one of the preceding claims wherein the treatment gas comprises from 1 to 10 mol% water vapour.

14. A process according to claim 13 wherein the treatment gas comprises from 2 to 10 mol% water vapour.

15. A process according to any one of the preceding claims wherein the treatment gas further comprises at least one component selected from one or more of carbon monoxide, hydrogen and dimethyl ether.

16. A process according to any one of the preceding claims wherein the treatment gas further comprises synthesis gas.

17. A process according to claim 16 wherein the synthesis gas has a molar ratio of carbon monoxide to hydrogen of from 15:1 to 1:3.

18. A process according to claim 17 wherein the molar ratio is 4:1 to 1:1.

19. A process according to any one of the preceding claims wherein the catalyst is contacted with the treatment gas for a period of from 10 minutes to 24 hours.

20. A process according to any one of the preceding claims wherein the catalyst is contacted with the treatment gas at a pressure in the range of from 10 to 100 barg.

21. A process according to any one of the preceding claims wherein the catalyst is contacted with the treatment gas at a gas hourly space velocity in the range 3000 to 10,000 h^{-1}.

22. A process according to any one of claims 4 to 21 wherein dimethyl ether is added to a treatment gas subsequent to commencing contact of the catalyst with the treatment gas but prior to ceasing contact of the catalyst with the water vapour.

23. A process according to claim 22 wherein dimethyl ether is added to the treatment gas for up to 1 minute to 1 hour prior to ceasing contact of the catalyst with water vapour.

24. A process according to claim 22 or claim 23 wherein dimethyl ether is added to the treatment gas at a concentration in the range 0.1 to 20 mol% based on the total components of the treatment gas.

25. A process according to claim 24 wherein the dimethyl concentration is in the range 1.5 to 5 mol% based on the total components of the treatment gas.

26. A process according to any one of claims 4 to 25 wherein in step (iii) a synthesis gas is employed as the source of carbon monoxide.

27. A process according to any one of claims 4 to 26 wherein step (iii) is carried out at a temperature of from 250 °C to 350 °C and at a total pressure of from 10 to 100 barg.

28. A process according to any one of claims 4 to 27 wherein methyl acetate is recovered from the reaction product and some or all of the recovered methyl acetate is converted to acetic acid.