C L A I M S

1. A process for producing ethylene oxide, comprising:

a. cracking an ethane-comprising feed in a cracking zone under cracking conditions to obtain olefins including at least ethylene and hydrogen;

b. converting an oxygenate feedstock in an oxygenate-to-olefin zone to obtain olefins, including at least ethylene;

c. providing at least part of the ethylene obtained in step (a) and /or (b) to an ethylene oxidation zone together with a feed containing oxygen and oxidising ethylene to obtain at least ethylene oxide and carbon dioxide; and wherein at least part of the oxygenate feedstock is obtained by providing carbon dioxide obtained in step (c) and a feed containing hydrogen to an oxygenate synthesis zone and synthesising oxygenates, which feed containing hydrogen comprises hydrogen obtained in step (a).

2. A process according to claim 1, wherein in step (a) a cracking zone effluent comprising ethylene and hydrogen is obtained and in step (b) an OTO zone effluent comprising olefins and hydrogen is obtained and at least part of the hydrogen in the feed containing hydrogen is obtained by combining at least part of the cracking zone effluent and at least part of the OTO zone effluent and separating hydrogen from the combined effluent.

3. A process according to claim 1 or 2, comprising converting at least part of the obtained ethylene oxide with water into mono-ethylene-glycol

4. A process according to claim any of the preceding claims, wherein the olefins obtained in step a) and/or b) further include propylene.

5. A process according to claim any of the preceding claims, wherein the feed containing hydrogen also comprises carbon monoxide.

6. A process according any one of the preceding claims, comprising providing carbon dioxide, hydrogen and preferably carbon monoxide to the oxygenate synthesis zone in a molar ratio of in the range of from 2.0 to 3.0, preferably 2.0 to 2.2.

7. A process according to claim 6, wherein carbon dioxide is present in a concentration in the range of from 0.1 to 25 mol%, preferably 3 to 10 mol%, more preferably of from 4 to 8 mol%, based on the total number of moles carbon dioxide, hydrogen, and preferably carbon monoxide.

8. A process according to any one of the proceeding claims, comprising combining at least part of the olefins obtained in step a) and b) in one stream.

9. A process according to any one of the preceding claims, wherein the feed containing hydrogen comprises a synthesis gas.

10. A process according to any one of the preceding claims, wherein the carbon dioxide is obtained as a stream comprising carbon dioxide, which further comprises chlorine and the stream comprising carbon dioxide is treated to remove chlorine prior to provided the stream comprising carbon dioxide to the oxygenate synthesis zone.

11. A process according to any one of the preceding claims, wherein the olefins obtained in step a) and/or b) include ethylene and comprising:

- converting at least part of the ethylene with benzene to obtain styrene monomer and hydrogen; and

- providing at least part of the hydrogen to the oxygenates synthesis zone comprised in the feed containing hydrogen.

12. A process according to any one of the preceding claims, comprising:

i) providing a feed comprising methane and ethane;

ii) separating the feed into at least a methane-comprising feed and an ethane-comprising feed;

iii) providing at least part the methane-comprising feed to a process for preparing synthesis gas to obtain a synthesis gas; and

iv) providing at least part of the ethane to the cracking zone and at least part of the synthesis gas to the oxygenate synthesis zone.

13. A process according to claim 12, wherein the feed comprising methane and ethane is natural gas or associated gas.

14. A process according to claim 12 or 13, wherein the feed comprising methane and ethane comprises in the range of 1 to 20 mol% of ethane, based on the total feed.

15. An integrated system for producing ethylene oxide, which system comprises:

a) a steam cracking system having one or more inlets for an ethane-comprising feedstock and steam, and an outlet for a cracker effluent comprising olefins, including at least ethylene, and hydrogen;

b) an oxygenate-to-olefins conversion system, having one or more inlets for receiving an oxygenate feedstock, and comprising a reaction zone for contacting the oxygenate feedstock with an oxygenate conversion catalyst under oxygenate conversion conditions, and an outlet for a oxygenate-to-olefins

effluent comprising olefins, including at least ethylene;

c) a work-up system arranged to receive at least part of the cracker effluent and at least part of the oxygenate-to-olefins effluent to obtain a combined effluent, the work-up section comprising a separation system, an outlet for ethylene and an outlet for hydrogen;

d) an ethylene oxidation system, having at least an inlet for ethylene and an inlet for oxygen and an outlet for ethylene oxide and an outlet for carbon dioxide, and comprising an ethylene oxidation zone for oxidising ethylene to ethylene oxide and carbon dioxide;

e) an oxygenate synthesis system having one or more inlets for a feed containing hydrogen and an inlet for carbon dioxide, and an outlet for an oxygenate feedstock; and means for providing carbon dioxide from the outlet for carbon dioxide of the ethylene oxidation system to the carbon dioxide inlet of the oxygenate synthesis system and means for providing hydrogen from the outlet for hydrogen of the work-up section to the inlet for a feed containing hydrogen of the oxygenate synthesis system.

What is claimed is:

1. A process for producing ethylene oxide, comprising: a. cracking an ethane-comprising feed in a cracking zone under cracking conditions to obtain olefins including at least ethylene and hydrogen; b. converting an oxygenate feedstock in an oxygenate-to-olefin zone to obtain olefins, including at least ethylene; and c. providing at least part of the ethylene obtained in step (a) and (b) to an ethylene oxidation zone together with a feed containing oxygen and oxidising ethylene to obtain at least ethylene oxide and carbon dioxide; wherein at least part of the oxygenate feedstock is obtained by providing carbon dioxide obtained in step (c) and a feed containing hydrogen to an oxygenate synthesis zone and synthesising oxygenates, which feed containing hydrogen comprises hydrogen obtained in step (a).

2. A process according to claim 1, wherein in step (a) a cracking zone effluent comprising ethylene and hydrogen is obtained and in step (b) an oxygenate-to-olefin zone effluent comprising olefins and hydrogen is obtained and at least part of the hydrogen in the feed containing hydrogen is obtained by combining at least part of the cracking zone effluent and at least part of oxygenate-to-olefin zone effluent and separating hydrogen from the combined effluent.

3. A process according to claim 1, wherein the olefins obtained in step a) and/or b) further include propylene.

4. A process according to claim 1, wherein the feed containing hydrogen also comprises carbon monoxide.

5. A process according to claim 1, comprising providing carbon dioxide and hydrogen, to the oxygenate synthesis zone in a molar ratio of in the range of from 2.0 to 3.0.

6. A process according to claim 5, wherein carbon dioxide is present in a concentration in the range of from 0.1 to 25 mol %, based on the total number of moles carbon dioxide, hydrogen, and carbon monoxide.

7. A process according to claim 1, comprising combining at least part of the olefins obtained in step a) and b) in one stream.

8. A process according to claim 1, wherein the feed containing hydrogen comprises a synthesis gas.

9. A process according to claim 1, wherein the carbon dioxide is obtained as a stream comprising carbon dioxide, which further comprises chlorine and the stream comprising carbon dioxide is treated to remove chlorine prior to providing the stream comprising carbon dioxide to the oxygenate synthesis zone.

10. A process according to claim 1, comprising: i) providing a feed comprising methane and ethane; ii) separating the feed into at least a methane-comprising feed and an ethane-comprising feed; iii) providing at least part the methane-comprising feed to a process for preparing synthesis gas to obtain a synthesis gas; and iv) providing at least part of the ethane to the cracking zone and at least part of

the synthesis gas to the oxygenate synthesis zone.

11. A process according to claim 10, wherein the feed comprising methane and ethane is natural gas or associated gas.

12. A process according to claim 10, wherein the feed comprising methane and ethane comprises in the range of 1 to 20 mol % of ethane, based on the total feed.