

Integrated process for simultaneously preparing alkali metal methoxides

In a first aspect, the present invention relates to an integrated process for simultaneously preparing n mixtures $P(i)$ comprising alkali metal methoxide and methanol, with a rectification column D comprising at least one reboiler $V(1a)$; the process comprising preparing one or more alkali metal methoxides in n reactive distillation columns $K(i)$ under reactive distillation conditions from n streams $H(i)$ and n streams $G(i)$ comprising methanol, thereby obtaining n top streams $W(i)$ comprising methanol and water; and obtaining n bottoms streams $P(i)$ comprising alkali metal methoxide $A(i)OMe$ and methanol; wherein at least a first stream $W(1)$ and a second stream $W(2)$ are at least partially fed into the rectification column D in that at least a part of the stream $W(1)$ is fed into the lower part of the rectification column D at a position $I(1)$; and at least a part of the stream $W(2)$ is fed into the lower part of the rectification column D at a position $I(2)$, wherein the position $I(2)$ is located below the position $I(1)$ and wherein between the positions $I(1)$ and $I(2)$, the rectification column D is equipped with internals. A second aspect of the invention relates to a chemical production unit for carrying out the process according to the first aspect; and a third aspect of the invention is directed to the use of a chemical production unit according to the second aspect or of a process according to the first aspect for simultaneously producing n mixtures $P(i)$ comprising alkali metal methoxide and methanol.

State of the art

In the prior art, processes are described wherein a mixture comprising an alkali metal alkoxide and methanol is prepared in a reactive distillation column from a methanol stream and an aqueous stream which comprises a dissolved alkali metal hydroxide. According to these processes, the methanol stream fed into the reactive distillation column is prepared by separating methanol from water in a distillation column upstream of the reactive distillation column and using the respectively obtained methanol to the reactive distillation column. In this respect, reference is made, for example, to US 2002/0183566 A1, US 2008/0296786 A1, or WO 2013/168113 A1. However, according to the teaching of these prior art documents, only one specific mixture comprising alkali metal methoxide and methanol could be produced.

WO 2021/148174 A1 refers to a process for simultaneously preparing two mixtures comprising sodium metal alkoxide and potassium metal alkoxide as well as methanol, wherein a single rectification column is employed for generating a methanol stream which is then used as a methanol source for two parallel downstream reactive distillation columns in which the two different mixtures comprising alkali metal alkoxide and methanol are simultaneously prepared. Methanol

containing streams from the two reactive distillation columns in vapor form are then combined and fed into the rectification column.

5 WO 2022/263032 A1 also discloses a process for simultaneously preparing two mixtures comprising alkali metal alkoxide and methanol in separate reactive distillation columns with one rectification column for methanol. Vaporous methanol containing streams from the two reactive distillation columns are combined and introduced into the rectification column.

10 WO 2022/117803 A1 discloses a process for simultaneously preparing two or more mixtures comprising alkali metal hydroxide and methanol, wherein a single rectification column D is employed for generating a methanol stream which is then used, after a suitable dividing into two or more substreams, as a methanol source for two or more parallel downstream reactive distillation columns in which two or more different mixtures comprising alkali metal methoxide and methanol are simultaneously prepared. Therein, a part stream of a vapor phase comprising methanol and taken at the top of the rectification column D, is compressed and used as heating medium for an intermediate reboiler of the rectification column D, thus covering the energy demand of said intermediate reboiler. Top streams from the reactive distillation columns containing methanol are combined and re-introduced into the single rectification column D for methanol recovery.

20 However, there is still a need for improvement, both in terms of energy demand and in terms of apparatus costs, but also in terms of product purity. For example, re-introduction of the methanol containing streams from the reactive distillation columns into the single distillation column D bears the problem of bringing water into said column D, this in turn having a negative impact on the purity and water content of the products intended to be obtained from the reactive distillation columns.

30 Therefore, it was an object of the present invention to provide an economically advantageous process for simultaneously preparing two or more mixtures comprising alkali metal hydroxide and methanol. It was a further object of the present invention to provide a process for preparing two or more mixtures comprising alkali metal hydroxide and methanol, which allows an improved purity of the desired products.

35 Surprisingly, it was found that these objects can be solved by a process according to which a single rectification column is used, wherein at least a first top stream W(1) comprising methanol and water and a second top stream W(2) comprising methanol and water from the reactive distillation columns are at least partially fed into the single rectification column D in that at least a part of the stream W(1) is fed into the lower part of the rectification column D at a position I(1);

- and at least a part of the stream W(2) is fed into the lower part of the rectification column D at a position I(2), wherein the position I(2) is located below the position I(1) and wherein between the positions I(1) and I(2), the rectification column D is equipped with internals. It was found that this arrangement results in a significantly smaller water concentration at the top of the rectification column D and also in a better product quality of the bottoms streams P(i) comprising alkali metal methoxide A(i)OMe and methanol obtained from the reactive distillation columns, especially the methanolic sodium methylate solution, especially a decreased water content of said methanolic sodium methylate solution.
- 5 Thus, the invention relates in a first aspect to an integrated process for simultaneously preparing n mixtures P(i) comprising alkali metal methoxide and methanol, comprising providing n reactive distillation columns K(i); providing n aqueous liquid streams H(i), a given stream H(i) comprising a dissolved alkali metal hydroxide A(i)OH, wherein n is an integer with $n \geq 2$ and $i = 1 \dots n$; and
- 10 providing a rectification column D comprising at least one reboiler V(1a); wherein the process comprises preparing the one or more alkali metal methoxides in the n reactive distillation column K(i) under reactive distillation conditions from the n streams H(i) and n streams G(i) comprising methanol, thereby obtaining n top streams W(i) comprising methanol and water; and obtaining n bottoms streams P(i) comprising alkali metal methoxide A(i)OMe and methanol;
- 15 the process further comprising
- (a) obtaining a vapor phase V comprising methanol at the top of the rectification column D, said vapor phase V having a pressure p_V and a temperature T_V ;
 - (b) preparing at least two streams from the vapor phase V, comprising a vapor stream G having a pressure p_G and a temperature T_G with $0.95 \leq p_G/p_V \leq 1.00$, and further comprising a stream T(1a), said stream T(1a) having a pressure $p_{T(1a)}$ and a temperature $T_{T(1a)}$ with $p_{T(1a)} > p_V$ and $T_{T(1a)} > T_V$;
 - (c) preparing the n streams G(i) from the vapor stream G, each of the streams G(i) having a pressure $p_{G(i)}$ and a temperature $T_{G(i)}$ with $p_{G(i)} > p_G$ for each stream G(i); and feeding each stream G(i) into the respective reactive distillation column K(i);
 - (d) passing at least a part of the stream T(1a) as a heating medium through the reboiler V(1a) of the rectification column D, obtaining a, preferably at least partially condensed, stream T_c(1a) having a temperature $T_{Tc(1a)}$ with $T_{Tc(1a)} < T_{T(1a)}$;
 - (e) feeding at least a part of the stream T_c(1a) into the rectification column D;
 - (f) feeding at least a first stream W(1) and a second stream W(2) at least partially into the rectification column D, comprising
 - (f.1) feeding at least a part of the stream W(1) into the lower part of the rectification column D at a position I(1);
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(f.2) feeding at least a part of the stream W(2) into the lower part of the rectification column D at a position I(2), wherein the position I(2) is located below the position I(1); wherein between the positions I(1) and I(2), the rectification column D is equipped with internals.

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Feeding of at least a part of the stream T_C(1a) into the rectification column D according to (e) is preferably done as explained in more detail herein below.

10 In some preferred embodiments of the process, the rectification column D is equipped below the position I(2) with internals.

In some preferred embodiments of the process, the rectification column D's internals are selected from tray, unstructured (random) packing, structured packing and mixtures of two or more thereof. Preferably, rectification column D comprises one or more internals, preferably selected from the group consisting of tray, unstructured (random) packing, structured packing and mixtures of two or more thereof. A tray is preferably selected from the group consisting of bubble tray, sieve tray, valve tray, tunnel tray, slot tray and mixtures of two or more thereof. An unstructured packing is preferably selected from the group consisting of Raschig rings, Pall rings, Berl saddles, Intalox saddles and mixtures of two or more thereof. Structured packings are sold, for example, under the trade name Mellapack® from Sulzer. In addition to the internals mentioned, other suitable internals are known to those skilled in the art and can also be used. If structured packings or unstructured packings are contained in the rectification column, these can be divided or there can be one continuous packing.

25 In some preferred embodiments of the process, the rectification column D has in the range of from 20 to 100, more preferably in the range of from 30 to 80, more preferably in the range of from 40 to 60 theoretical trays. In some preferred embodiments of the process, position I(2) is located in the lower half of rectification column D, preferably in the lower third of rectification column D, wherein more preferably I(2) is located between the 4th and the 20th theoretical stage, more preferably between the 5th and the 15th theoretical stage, more preferably between the 5th and the 12th theoretical stage of the rectification column D, counted from the bottom. In some preferred embodiments of the process, position I(1) is located in the lower half of rectification column D, preferably in the lower third of rectification column D, wherein more preferably in the range of from 1 to 15 preferably of from 2 to 10, more preferably of from 3 to 5, theoretical trays are present between the position I(2) and I(1).

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The methanol concentration in stream W(1) $c_{\text{MeOH}}(1)$ is preferably higher than the MeOH concentration in W(2) $c_{\text{MeOH}}(2)$ with $c_{\text{MeOH}}(1) > c_{\text{MeOH}}(2)$, so that W(1) is fed into rectification column

D at a position I(1), wherein the MeOH concentration at that position I(1) within the rectification column D $c_{\text{MeOH}}(\text{D1})$ is preferably about equal to $c_{\text{MeOH}}(1)$ with $0.95 \leq c_{\text{MeOH}}(1)/c_{\text{MeOH}}(\text{D1}) \leq 1.05$. W(2) is preferably fed into rectification column D at a position I(2), wherein the MeOH concentration at that position I(2) within the rectification column D $c_{\text{MeOH}}(\text{D2})$ is preferably about equal to $c_{\text{MeOH}}(2)$ with $0.95 \leq c_{\text{MeOH}}(2)/c_{\text{MeOH}}(\text{D2}) \leq 1.05$. This preferred feeding manner enables a most efficient processing of rectification column D.

In some preferred embodiments, the process comprises for n reactive distillation columns K(i), feeding the stream G(i) into the lower part of the reactive distillation column K(i) and feeding the aqueous liquid stream H(i) into the upper part of the reactive distillation column K(i).

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In some preferred embodiments of the process, prior to preparing the n streams G(i) from the vapor stream G according to (c), the stream G is passed through a compressor C_c, thereby obtaining a compressed stream G_c having a pressure $p_{G_c} > p_G$. In some preferred embodiments of the process, prior to be fed into the reactive distillation column K(i), each of the n streams G(i) is passed through a compressor C(i), thereby obtaining n compressed streams G_{c(i)} having a pressure $p_{G_{c(i)}}$ with $p_{G_{c(i)}} > p_G$.

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In some preferred embodiments of the process, n is 2 (n = 2). Preferably, the stream H(1) comprises dissolved sodium hydroxide and the stream H(2) comprises dissolved potassium hydroxide, wherein sodium methoxide is prepared in the reactive distillation column K(1) from which the stream W(1) is obtained and potassium methoxide is prepared in the reactive distillation column K(2) from which the stream W(2) is obtained.

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In some preferred embodiments of the process, the stream W(1) comprises methanol and water at a molar methanol-to-water ratio r(1) and wherein the stream W(2) comprises methanol and water at a molar methanol-to-water ratio r(2) with $r(2) < r(1)$. In other words, the water content of stream W(1) is lower than the water content of the stream W(2).

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In some preferred embodiments, the process comprises feeding a stream M comprising methanol into the rectification column D at a position I(M). In these preferred embodiments of the process, the positions I(1) and I(2) are preferably located below the position I(M). I(M) is preferably in the upper half of rectification column D, more preferably in the upper third of rectification column D; and I(1) and I(2) are located in the lower half of rectification column D.

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As indicated above, a stream M comprising methanol is fed into the rectification column D. This stream M, also referred to as fresh methanol stream M, is fed into D in order provide sufficient methanol for the overall process, in particular to compensate the loss of methanol removed from the process via the mixtures P(i). Generally, there are no specific requirements as far as the

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- methanol content of M is concerned, and the skilled person will be in the position to choose suitable methanol streams M. Preferably, however, it is preferred that the stream M comprises only a low amount of water. Therefore, it is further preferred that from 99 to 100 weight-%, more preferably from 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of the stream M
- 5 consist of methanol and optionally water, wherein the amount of water comprised in the stream M is preferably at most 2000 weight-ppm, more preferably at most 1500 weight-ppm, more preferably at most 1000 weight-ppm, such as at most 750 weight-ppm or at most 500 weight-ppm or at most 250 weight-ppm.
- 10 Generally, the stream M can be fed into the rectification column D at any suitable position. However, as indicated above, I(M) is preferably in the upper half of rectification column D, more preferably in the upper third of rectification column D, more preferably at least 2, 3 or 4 theoretical stages from the top of D, more preferably at least 4 theoretical stages from the top of D, more preferably between the 4th and the 20th theoretical stage from the top of D, more preferably be-
- 15 tween the 6th and the 15th theoretical stage from the top of D, such as between the 6th and the 10th theoretical stage or between to 8th and the 12th theoretical stage or between the 10th and the 14th theoretical stage or between to 12th and the 15th theoretical stage.

- Preferably, M with its methanol concentration $c_{\text{MeOH}}(\text{M})$ is fed into rectification column D at a position I(M), wherein the MeOH concentration at that position I(M) within the rectification column D $c_{\text{MeOH}}(\text{DM})$ is preferably about equal to $c_{\text{MeOH}}(\text{M})$ with $0.95 \leq c_{\text{MeOH}}(\text{M})/c_{\text{MeOH}}(\text{DM}) \leq 1.05$. This preferred feeding manner enables a most efficient processing of rectification column D.
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- As far as the temperature of the stream M is concerned at which the stream M is fed into D, it is preferred that the temperature is in the range of from ambient temperature up to the boiling point of methanol at the column pressure of D; more preferably the temperature is ambient temperature.
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- In some preferred embodiments of the process, the rectification column D is operated at a pressure at the top of D in the range of from 0.5 to 10 bar(abs), preferably in the range of from 0.75 to 6 bar(abs), more preferably in the range of from 1 to 5 bar(abs), more preferably in the range of from 1 to 3 bar(abs). In some preferred embodiments of the process, the rectification column D is operated at a temperature at the top of D in the range of from 45 to 137 °C, preferably in the range of 49 to 118, more preferably in the range of from 64 to 111 °C, more preferably in the
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- 35 range of from 64 to 95°C.

Rectification column D without top vapor recompression

In some embodiments of the process, the rectification column D is operated without top vapor recompression.

Rectification column D with top vapor recompression

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In some preferred embodiments of the process, the rectification column D is operated at a reflux ratio of at least 0.5:1, preferably in the range of from 0.55:1 to 1.4:1, or preferably in the range of from 0.6:1 to 1.4:1. Preferably, the rectification column is operated with top vapor recompression. In some preferred embodiments of the process, realizing the reflux ratio comprises preparing from the vapor phase V a further vapor stream T(2), passing said stream T(2) through a condenser V(2), obtaining a liquid stream T(3) and a waste gas stream T(2w), and feeding the liquid stream T(3) into the top of the rectification column D. Preferably, the waste gas stream T(2w) essentially consists of oxygen, nitrogen, carbon dioxide and methanol, wherein the amount of methanol in T(2w) is preferably in the range of from 2 to 80 weight-%, preferably in the range of from 10 to 30 weight-% based on the total weight of T(2w).

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Recirculation of $T_c(1a)$ into D

In some preferred embodiments of the process, at least a part of $T_c(1a)$ is fed to a condensate drum CD(1), wherein from said condensate drum CD(1), a gas stream T(1g) and a liquid stream T(1l) are removed, said gas stream T(1g) being fed into the condenser V(2) together with T(2) and said liquid stream T(1l) being combined with the liquid streams T(2l) and (T2gl) in depressurized form, obtaining a combined liquid stream which is fed as the stream T(3) into the top of the rectification column D. In "depressurized form" regarding the liquid streams T(1l), T(2l) and (T2gl) and the combined stream respectively means that these streams and respectively the combined liquid stream therefrom have a pressure p_{cs} about equal to the pressure at the top of rectification column D as described above, i.e. $0.95 \leq p_{cs}/p_{ID} \leq 1.05$.

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In particular in view of overall energy consumption topics, the rectification column D is operated with top vapor recompression. Reference is made, for example, to the schematic overview in Figure 1 showing a process according to the present invention with reflux. When the rectification column is operated with top vapor recompression, it is also preferred that realizing the reflux ratio comprises using 2 condensers, V(2) and V(3), as described below in that

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- (i) in addition to the at least two streams G and T(1a), which are prepared from the vapor phase V, preparing a further stream T(2) from the vapor phase V and passing said stream T(2) through the condenser V(2), obtaining a liquid stream T(2l) and a gas stream T(2g); passing the gas stream T(2g) through the condenser V(3), obtaining a liquid stream T(2gl)
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- and a waste gas stream T(2w); and combining the liquid streams T(2l) and (T2gl) in depressurized form in a second condensate drum CD(2);
- (ii) feeding T_c(1a), at least partially, to a first condensate drum CD(1), wherein from said first condensate drum CD(1), a gas stream T(1g) and a liquid stream T(1l) are removed, said gas stream T(1g) being fed into the condenser V(2) together with T(2) and said liquid stream T(1l) being combined with the liquid streams T(2l) and (T2gl) in depressurized form in the second condensate drum CD(2), obtaining a combined liquid stream which is fed as the stream T(3) into the top of the rectification column D.
- Certainly, as far as step (i) above is concerned, the skilled person may also realize, if need be, said reflux ratio by using more than the 2 condensers V(2) and V(3) or by using only one condenser V(2).

Vapor phase V

- In some preferred embodiments of the process, the vapor phase V has a pressure p_v , in the range of from 0.5 to 10 bar(abs), preferably in the range of from 0.75 to 6 bar(abs), more preferably in the range of from 1 to 5 bar(abs), more preferably in the range of from 1 to 3 bar(abs). In some preferred embodiments of the process, the vapor phase V has a temperature T_v in the range of from 45 to 137 °C, preferably in the range of 49 to 118, more preferably in the range of from 64 to 111 °C, more preferably in the range of from 64 to 95°C .

Stream taken from rectification column D for heating purpose regarding reboiler V(1a)

- In some preferred embodiments of the process, a stream T(Di) having a temperature $T_{T(Di)}$ and a pressure $p_{T(Di)}$ is taken from the rectification column D and passed for heating purpose through the reboiler V(1a) of the rectification column D, obtaining a heated stream T_h(Di) having a temperature $T_{Th(Di)}$ with $T_{Th(Di)} > T_{T(Di)}$, wherein heated stream T_h(Di) is reintroduced into rectification column D. Heated stream T_h(Di) preferably comprises two phases, i.e. a gaseous and a liquid part. In some preferred embodiments of the process, V(1a) is an intermediate reboiler of the rectification column D and the stream T(Di) is preferably taken at an intermediate position from rectification column D.

Stream T(1)

- In some preferred embodiments of the process, preparing the at least two streams according to (b) comprises

- (b.1) splitting the vapor phase V into at least two vapor streams comprising the stream G and a vapor stream T(1) having a pressure $p_{T(1)}$ and a temperature $T_{T(1)}$ with $0.95 \leq p_{T(1)}/p_V \leq 1.00$;
- (b.2) preparing at least stream T(1a) from the vapor stream T(1), wherein for preparing the stream T(1a) a first compression unit C_{T(1)} is employed.

Stream T(1a)

In some preferred embodiments of the process, stream T(1a) has a pressure $p_{T(1a)}$, which is adjusted so that $T_{\text{cond}T(1a)} \geq T_{\text{boil}T(Di)} + 3 \text{ K}$, wherein $T_{\text{cond}T(1a)}$ is the condensation temperature of stream T(1a) at a pressure $p_{T(1a)}$ and $T_{\text{boil}T(Di)}$ is the boiling temperature of stream T(Di) at a pressure $p_{T(Di)}$. In some preferred embodiments of the process, stream T(1a) has a condensation temperature $T_{\text{cond}T(1a)}$ which is in the range of from 3 to 30 K, preferably in the range of from 4 and 25 K, more preferably in the range of from 5 and 20 K, higher than $T_{\text{boil}T(Di)}$.

Stream G, streams G(i)

With respect to the stream G, it is preferred that said stream G comprises methanol and water, wherein more preferably from 99.95 to 100 weight-% of G consist of methanol and water, and wherein the water content of G is at most 200 weight-ppm, more preferably at most 150 weight-ppm, more preferably at most 100 weight-ppm, wherein more preferably, said water content is in the range of from 5 to 100 weight-ppm, more preferably in the range of from 10 to 100 weight-ppm, more preferably in the range of from 15 to 100 weight-ppm. According to (c), n streams G(i) are prepared from the vapor stream G, each of the streams G(i) having a pressure $p_{G(i)}$ and a temperature $T_{G(i)}$ with $p_{G(i)} > p_G$ and $T_{G(i)} > T_G$ for each stream G(i), and feeding each stream G(i) into the respective reactive distillation column K(i), wherein for preparing the n streams G(i), the at least one compression unit C_G is employed.

Preferably, the stream G is divided into the two streams G(1) and G(2), wherein the stream G has a mass flow rate $f(G)$, the stream G(1) has a mass flow rate $f(G(1))$ and the stream G(2) has a mass flow rate $f(G(2))$, wherein $f(G) = f(G(1)) + f(G(2))$. Generally, the stream G can be divided by any conceivable method. Preferably (c) comprises passing the stream G into a stream dividing device S, said device more preferably comprising a pipe junction. In context, it is noted that the term "the stream is divided into two streams" refers to a method according to which the streams obtained from said dividing have the same chemical composition as the stream G. As far as the ratios $f(G(1))/f(G)$ and $f(G(2))/f(G)$ are concerned, the present invention allows for a flexible adjusting of said ratios in that the individual flow rates $f(G(1))$ and $f(G(2))$ can be chosen

depending on the desired amount of A(1)OMe, preferably sodium methoxide, to be obtained relative to the desired amount of A(2)OMe, preferably potassium methoxide, to be obtained.

- Prior to dividing according to (c), the stream G can be passed through the at least one compression unit C_G , thereby realizing a pressure increase of G. Preferably, the pressure is suitably increased so that the pressure of the streams after dividing is adapted to the desired pressure when the streams are fed into the reactive distillation columns K(i) and ultimately, via the streams W(i), back into D. Preferably, said pressure increase is in the range of from 0.1 to 0.8 bar, more preferably in the range of from 0.15 to 0.6 bar, more preferably in the range of from 0.2 to 0.4 bar. According to this embodiment of the present invention, it is preferred that the dividing according to (c) comprises passing the compressed stream G into a stream dividing device S, said device preferably comprising a pipe junction and at least one control device allowing for adjusting the ratio $f(G(1))/f(G(2))$, wherein said at least one control device is located downstream of said pipe junction. At least one of these control devices is located either in the stream G(1) or in the stream G(2) or in both streams G(1) and G(2), and it is preferred that the at least one control device preferably is a control valve. Afterwards, the compressed stream G is fed into the dividing device S and consequently, the resulting streams G(1) and G(2) are fed into the reactive distillation columns K(1) and K(2) respectively. Alternatively, the pressure increase mentioned above is realized not by compressing the stream G prior to, but after dividing. In this alternative embodiment, stream G is fed to a dividing device S and divided in a stream G(1) and a stream G(2). Prior to be fed into the reactive distillation column K(1), the stream G(1) is passed through a compression unit $C_G(1)$, thereby realizing a pressure increase of G(1) in the range of from 0.1 to 0.8 bar, preferably in the range of from 0.15 to 0.6 bar, more preferably in the range of from 0.2 to 0.4 bar. Certainly, said compression of G(1) can be combined with a pre-compression of the stream G prior to dividing; however, it is preferred that this compressing of G(1) is performed with no compression of G being performed prior to dividing. Consequently, in this alternative embodiment, it is also preferred that prior to be fed into the reactive distillation column K(2), the stream G(2) is passed through a compressor $C_G(2)$, thereby realizing a pressure increase of G(2) in the range of from 0.1 to 0.8 bar, preferably in the range of from 0.15 to 0.6 bar, more preferably in the range of from 0.2 to 0.4 bar. Certainly, said compression of G(2) can be combined with a pre-compression of the stream G prior to dividing; however, it is preferred that this compressing of G(2) is performed with no compression of G being performed prior to dividing.
- As far as the stream H(1) is concerned, it is preferred that from 99 to 100 weight-%, more preferably from 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of the stream H(1) consist of A(1)OH and water, wherein more preferably from 37.5 to 58 weight-%, more preferably from 40 to 55 weight-%, more preferably from 42.5 to 52 weight-% of the stream H(1)

consist of A(1)OH, preferably sodium hydroxide. Preferably the stream H(1) is fed into the reactive distillation column K(1) at a temperature of H(1) in the range of from ambient temperature to its boiling temperature, more preferably in the range of from 50 to 80 °C such as from 50 to 60 °C or from 60 to 70 °C or from 70 to 80 °C. Heating of the stream H(1) to this temperature may be accomplished with any suitable means such as a heat exchanger. It is preferred that the stream H(1) is fed into the top of the reactive distillation column K(1), more preferably to the first theoretical stage from the top.

As to the reactive distillation column K(1), it is preferred that said column has from 5 to 50, more preferably from 10 to 40, more preferably from 15 to 30 theoretical stages, such as from 15 to 20 or from 20 to 25 or from 25 to 30 theoretical stages. Generally, the stream G(1) can be fed at any suitable position into K(1); preferably, G(1) is fed into the reactive distillation column K(1) at a position between the bottoms and the 5th theoretical stage, more preferably between the bottoms and the 3rd theoretical stage, more preferably between the bottoms and the 2nd theoretical stage of the reactive distillation column K(1). Preferably, the reactive distillation column K(1) is operated at a pressure at the top in the range of from 0.5 to 10 bar(abs), more preferably in the range of from 1 to 6 bar(abs), more preferably in the range of from 1 to 5 bar(abs). Suitable preferred ranges are, for example, from 1 to 3 bar(abs) or from 2 to 4 bar(abs) or from 3 to 5 bar(abs). While it is generally possible to operate the reactive distillation column K(1) with reflux, it is preferred that the reactive distillation column K(1) is operated at a reflux ratio of 0:1.

As far as the stream W(1) is concerned which is obtained from the top of K(1), it is preferred that from 99 to 100 weight-%, more preferably from 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of W(1) consist of methanol and water. More preferably, from 1 to 10 weight-%, more preferably from 2 to 8 weight-%, more preferably from 4 to 7 weight-%, more preferably from 5 to 6 weight-% of the stream W(1) consist of water.

As far as the mixture P(1) is concerned, it is preferred that from 99 to 100 weight-%, more preferably from 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of the stream P(1) consist of A(1)OMe, preferably sodium methoxide, and methanol. More preferably, from 10 to 50 weight-%, more preferably from 20 to 40 weight-%, more preferably from 25 to 35 weight-% of the stream P(1) consist of A(1)OMe, preferably sodium methoxide. More preferably, at most 5000 weight-ppm, more preferably at most 2000 weight-ppm, more preferably at most 1000 weight-ppm of the stream P(1) consist of water. Conceivable maximum water contents may include, for example, 750 weight-ppm or 500 weight-ppm or 250 weight-ppm. Preferably, the concentration of A(1)OMe, preferably sodium methoxide in the stream P(1) are realized by the skilled person by operating the reactive distillation column K(1) at a respective reboiler duty.

According to the present invention, it is preferred that the top of the reactive distillation column K(1) is equipped with a suitable droplet separating device D(1), preferably a demister. Thus, the process preferably comprises separating droplets comprising A(1)OH, preferably sodium hydroxide, from the vapor stream in the top of K(1). It is further preferred that, in particular for
5 cleaning purposes, said demister is suitably treated with a suitable stream M(1). A preferred treating may comprise, preferably consist of at least temporarily spraying the demister with the stream M(1). Regarding the chemical composition of M(1), it is especially preferred that M(1) comprises methanol, wherein it is more preferred that M(1) is branched from a condensed top stream removed from the rectification column D, for example one of the streams described
10 above, or being a fresh methanol stream, for example a stream branched from the stream M described above.

As far as the stream H(2) is concerned, it is preferred that from 99 to 100 weight-%, more preferably from 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of the stream
15 H(2) consist of A(2)OH, preferably potassium hydroxide, and water, wherein more preferably 30 to 55 weight-%, more preferably from 40 to 52.5 weight-%, more preferably from 45 to 50 weight-% of the stream H(2) consist of A(2)OH, preferably potassium hydroxide. Preferably the stream H(2) is fed into the reactive distillation column K(2) at a temperature of H(2) in the range of from ambient temperature to its boiling temperature, more preferably in the range of from 50
20 to 80 °C such as from 50 to 60 °C or from 60 to 70 °C or from 70 to 80 °C. Heating of the stream H(2) to this temperature may be accomplished with any suitable means such as a heat exchanger. It is preferred that the stream H(2) is fed into the top of the reactive distillation column K(2), more preferably to the first theoretical stage from the top.

As to the reactive distillation column K(2), it is preferred that said column has from 5 to 50, more preferably from 10 to 40, more preferably from 15 to 30 theoretical stages, such as from 15 to 20 or from 20 to 25 or from 25 to 30 theoretical stages. Generally, the stream G(2) can be fed at any suitable position into K(2); preferably, G(2) is fed into the reactive distillation column K(2) at a position between the bottoms and the 5th theoretical stage, more preferably between the bottoms and the 3rd theoretical stage, more preferably between the bottoms and the 2nd theoretical
30 stage of the reactive distillation column K(2). Preferably, the reactive distillation column K(2) is operated at a pressure at the top in the range of from 0.5 to 10 bar(abs), more preferably in the range of from 1 to 6 bar(abs), more preferably in the range of from 1 to 5 bar(abs). Suitable preferred ranges are, for example, from 1 to 3 bar(abs) or from 2 to 4 bar(abs) or from 3 to 5
35 bar(abs). While it is generally possible to operate the reactive distillation column K(2) with reflux, it is preferred that the reactive distillation column K(2) is operated at a reflux ratio of 0:1.

As far as the stream W(2) is concerned which is obtained from the top of K(2), it is preferred that from 99 to 100 weight-%, more preferably from 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of W(2) consist of methanol and water. More preferably, from 1 to 15 weight-%, more preferably from 2 to 12 weight-%, more preferably from 6 to 10 weight-% of the stream

5 W(2) consist of water.

As far as the mixture P(2) is concerned, it is preferred that from 99 to 100 weight-%, more preferably from 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of the stream P(2) consist of A(2)OMe, preferably potassium methoxide, and methanol. More preferably, from 10

10 to 50 weight-%, more preferably from 20 to 40 weight-%, more preferably from 25 to 35 weight-% of the stream P(2) consist of A(2)OMe, preferably potassium methoxide. More preferably, at most 5000 weight-ppm, more preferably at most 2000 weight-ppm, more preferably at most 1000 weight-ppm of the stream P(2) consist of water. Conceivable maximum water contents may include, for example, 750 weight-ppm or 500 weight-ppm or 250 weight-ppm. Preferably,

15 the concentration of A(2)OM, preferably potassium methoxide in the stream P(2) are realized by the skilled person by operating the reactive distillation column K(2) at a respective reboiler duty.

According to the present invention, it is preferred that the top of the reactive distillation column K(2) is equipped with a suitable droplet separating device D(2), preferably a demister. Thus, the

20 process preferably comprises separating droplets comprising A(2)OH, preferably potassium hydroxide, from the vapor stream in the top of K(2). It is further preferred that, in particular for cleaning purposes, said demister is suitably treated with a suitable stream M(2). A preferred treating may comprise, preferably consist of at least temporarily spraying the demister with the stream M(2). Regarding the chemical composition of M(2), it is especially preferred that M(2)

25 comprises methanol, wherein it is more preferred that M(2) is branched from a condensed top stream removed from the rectification column D, for example one of the streams described above, or being a fresh methanol stream, for example a stream branched from the stream M described above.

30 In the above, it was described that according to the present invention, the stream G, prior to dividing, is preferably passed through a compression unit C_G. According to the present invention, it is also possible that either in addition to at least one of the above alternatives or, preferably as the sole respective compression, prior to being fed into the rectification column D, the stream W(1) is passed through a compression unit C_G(1), thereby realizing a pressure increase of W(1)

35 preferably in the range of from 0.1 to 0.8 bar, more preferably in the range of from 0.15 to 0.6 bar, more preferably in the range of from 0.2 to 0.4 bar, and prior to being fed into the rectification column D, the stream W(2) is passed through a compression unit C_G(2), thereby realizing a pressure increase of W(2) in the range of from 0.1 to 0.8 bar, more preferably in the range of

- from 0.15 to 0.6 bar, more preferably in the range of from 0.2 to 0.4 bar. According to this embodiment of the present invention, it is also possible to suitably combine the streams W(1) and W(2), prior to being passed through a compressor, in a combining device to obtain a respective combined stream W, and pass said combined stream W, prior to being fed into D, through a
- 5 compressor, thereby realizing a pressure increase of W(1) preferably in the range of from 0.1 to 0.8 bar, more preferably in the range of from 0.15 to 0.6 bar, more preferably in the range of from 0.2 to 0.4 bar. Said combining device preferably comprises a pipe junction and at least one control device, preferably a control valve.
- 10 As far as the integrated process of the present invention is concerned, it is noted that for simultaneously preparing, in addition to the 2 mixtures P(1) and P(2) as described above in detail, a 3rd mixture P(3) etc. can be obtained, the skilled person, based on his general knowledge, will be in the position to derive from said details above in a straight-forward manner also any detail adjusting the overall process. According to the present invention, it is also conceivable that from
- 15 at least one of the streams P(i), A(i)OMe is at least partially separated from methanol, more preferably obtaining solid, more preferably crystalline A(i)OMe. Thus, solid, preferably crystalline sodium methoxide and solid, preferably crystalline potassium methoxide, can be obtained.

Parallel compression of T(1a), T(1b)

- 20 In some preferred embodiments of the process, the rectification column D comprises at least one reboiler V(1a) and at least one reboiler V(1b) and wherein the at least one reboiler V(1a) is an intermediate reboiler and the at least one reboiler V(1b) is a bottom reboiler;
- wherein (b) comprises preparing at least three streams from the vapor phase V, comprising the
- 25 vapor stream G having a pressure p_G and a temperature T_G with $0.95 \leq p_G/p_V \leq 1.00$, and further comprising two streams T(1a) and T(1b), said stream T(1a) having a pressure $p_{T(1a)}$ and a temperature $T_{T(1a)}$ with $p_{T(1a)} > p_V$ and $T_{T(1a)} > T_V$ and said stream T(1b) having a pressure $p_{T(1b)}$ and a temperature $T_{T(1b)}$ with $p_{T(1b)} > p_V$ and $T_{T(1b)} > T_V$;
- wherein (d) comprises
- 30 (d.1) passing at least a part of the stream T(1a) as a heating medium through a reboiler V(1a), preferably an intermediate reboiler V(1a), of the rectification column D, obtaining a stream $T_{C(1a)}$ having a temperature $T_{Tc(1a)}$ with $T_{Tc(1a)} < T_{T(1a)}$;
- (d.2) passing at least a part of the stream T(1b) as a heating medium through a reboiler V(1b), preferably a bottom reboiler V(1b), of the distillation column D, obtaining a stream $T_{C(1b)}$
- 35 having a temperature $T_{Tc(1b)}$ with $T_{Tc(1b)} < T_{T(1b)}$; and
- wherein (e) comprises
- (e.1) feeding at least a part of the stream $T_{C(1a)}$ into the rectification column D;
- (e.2) feeding at least a part of the stream $T_{C(1b)}$ into the rectification column D.

Feeding of at least a part of the stream $T_c(1a)$ into the rectification column D according to (e.1) is preferably done as explained in more detail herein, and also feeding at least a part of the stream $T_c(1b)$ into the rectification column D according to (e.2) is preferably done as explained
 5 in more detail herein.

In some preferred embodiments of the process, preparing the at least three streams according to (b) comprises

- (b.1) splitting the vapor phase V into at least two vapor streams comprising the stream G and a
 10 vapor stream T(1) having a pressure $p_{T(1)}$ and a temperature $T_{T(1)}$ with $0.95 \leq p_{T(1)}/p_V \leq 1.00$;
- (b.2) preparing at least the two streams T(1a) and T(1b) from the vapor stream T(1).

*Streams taken from rectification column D for heating purpose regarding intermediate reboiler
 15 (V1a) and bottom reboiler V(1b)*

In some preferred embodiments of the process, a stream $T(Di)$ is taken from the rectification column D at an intermediate position and passed for heating purpose through an intermediate reboiler V(1a) of the rectification column D, obtaining a heated stream $T_h(Di)$ having a tempera-
 20 ture $T_{Th(Di)}$ with $T_{Th(Di)} > T_{T(Di)}$, wherein heated stream $T_h(Di)$ is reintroduced into rectification column D; and
 a stream $T(Db)$ is taken from the rectification column D at a bottom position and passed for heating purpose through the bottom reboiler V(1b) of the rectification column D, obtaining a stream $T_h(Db)$ having a temperature $T_{Th(Db)}$ with $T_{Th(Db)} > T_{T(Db)}$, wherein heated stream $T_h(Db)$ is
 25 reintroduced into rectification column D.

As described above, heated stream $T_h(Di)$ preferably comprises two phases, i.e. a gaseous and a liquid part. Analogously, heated stream $T_h(Db)$ preferably comprises two phases, i.e. a gaseous and a liquid part.

30
Stream T(1b)

In some preferred embodiments of the process, stream T(1b) has a pressure $p_{T(1b)}$, which is adjusted so that $T_{condT(1b)} \geq T_{boilT(Db)} + 3 \text{ K}$, wherein $T_{condT(1b)}$ is the condensation temperature of
 35 stream T(1b) at a pressure $p_{T(1b)}$ and $T_{boilT(Db)}$ is the boiling temperature of stream T(Db) at a pressure $p_{T(Db)}$. In some preferred embodiments of the process, T(1b) has a condensation temperature $T_{condT(1b)}$ which is in the range of from 3 to 30 K, preferably in the range of from 4 and 25 K, more preferably in the range of from 5 and 20 K, higher than $T_{boilT(Db)}$.

2nd aspect - Chemical production unit

A second aspect of the present invention is directed to a chemical production unit for carrying
5 out the process according to the second aspect of the invention, comprising

- a rectification column D comprising
 - in its lower part, inlet means for feeding streams $W(i)$ or one or more combined stream thereof into D;
 - in its upper part, outlet means for removing a vapor stream V or divided streams
10 thereof, comprising at least a gaseous stream G and at a stream T(1a), from the top of D;
 - at least one reboiler V(1a);
- optionally a stream dividing device S_o for dividing V or substreams of V into (further) sub streams thereof;
- 15 - a first compressor $C_T(1)$ for compressing T(1a) or a part thereof;
- means for passing compressed sub streams of T(1) from $C_T(1)$ as heating medium through reboiler V(1a);
- a stream dividing device S for dividing the stream G into n streams $G(i)$;
- 20 - means for passing the stream G to said stream dividing device S;
- n reactive distillation columns $K(i)$, $n \geq 2$ and $i = 1 \dots n$; said reactive distillation columns $K(i)$ being arranged in parallel, each reactive distillation column $K(i)$ comprising
 - in its upper part, preferably in its top, inlet means for feeding a stream $H(i)$ into $K(i)$;
 - in its lower part, inlet means for feeding a stream $G(i)$ into $K(i)$;
 - 25 -- outlet means for removing a stream $W(i)$ from the top of $K(i)$;
 - a bottom reboiler;
 - outlet means for removing a bottoms stream from $K(i)$;
 - a stream dividing means for separating a stream $P(i)$ from the bottoms stream removed from $K(i)$;
- 30 - means for passing the streams $G(i)$ to the reactive distillation columns $K(i)$;
- preferably spatially separated means for passing at least one of the streams $W(i)$ and at least another one of the streams $W(i)$ at different positions to the rectification column D;
- 35 - one or more compressors $C(i)$ for compressing either the stream G and/or the streams $G(i)$ and/or the streams $W(i)$.

Spatially separated means for passing at least one of the streams $W(i)$ and at least another one of the streams $W(i)$ at different positions to the rectification column D are preferably spatially separated in that they are located at different heights of the rectification column D.

- 5 In some preferred embodiments, the chemical production unit comprises means for feeding a stream $W(1)$ into the lower part of the rectification column D at a position $I(1)$ and further means for feeding a stream $W(2)$ into the lower part of the rectification column D at a position $I(2)$, wherein the position $I(2)$ is located below the position $I(1)$. Preferably, the rectification column D of the chemical production unit is equipped with internals between the positions $I(1)$ and $I(2)$.

10

All details, embodiments and preferred embodiments described above in the section related to the first aspect of the invention also apply for the second aspect of the invention.

- 15 In some preferred embodiments, the chemical product unit comprises an intermediate reboiler $V(1a)$ and a bottom reboiler $V(1b)$ and further a second compressor $C_T(2)$ for compressing $T(1b)$ or a part thereof, and means for passing compressed sub streams of $T(1)$ from $C_T(2)$ as heating medium through bottom reboiler $V(1b)$.

- 20 In some preferred embodiments, the chemical product unit comprises means for passing condensed sub streams of $T(1a)$ and optionally of $T(1b)$ after passage through intermediate reboiler $V(1a)$ and optionally through bottom reboiler $V(1b)$ into D, the means preferably comprising
- at least one condenser, preferably a condenser $V(2)$ and optionally a further condenser $V(3)$ arranged downstream of $V(2)$, having inlet means for receiving condensed stream of $T(1a)$ after passage through intermediate reboiler $V(1a)$ and optionally condensed stream
 - 25 $T(1b)$ after passage through bottom reboiler $V(1b)$, and having outlet means for removing a condensed stream $T(3)$ and for removing a waste gas stream;
 - inlet means for feeding the stream $T(3)$ to the top of D.

- 30 In some preferred embodiments, the chemical product unit comprises inlet means for feeding a methanol stream M into D.

- Preferably, the top of at least one, more preferably of each reactive distillation column $K(i)$ is equipped with a droplet separating device $D(i)$, more preferably a demister, said demister more preferably comprising an inlet means for feeding a stream $M(i)$ comprising methanol into said
- 35 demister. Preferably each of the reactive distillations columns $K(i)$ comprises, independently from one another, from 5 to 50, more preferably from 10 to 40, more preferably from 15 to 30 theoretical stages. It is preferred that the means for passing the streams $G(i)$ to the reactive distillation columns $K(i)$ are located, independently from one another, at a position between the

bottoms and the fifth theoretical stage, more preferably between the bottoms and the third theoretical stage, more preferably between the bottoms and the second theoretical stage of K(i). Preferably, the means for passing the streams H(i) into the reactive distillation columns K(i) are located at the top of K(i), preferably at the uppermost theoretical stage. Preferably at least one, more preferably each reactive distillation columns K(i) does not comprise means for being operated at a reflux ratio of greater than 0:1. Preferably each reactive distillation column K(i) is equipped with trays.

It is preferred that the chemical production unit of the present invention comprises at least one compression unit C_G arranged upstream of K(i) for compressing the stream G before passage into the stream dividing device S. Alternatively, it is preferred that the unit of the present invention comprises n compressors C(i) arranged downstream of K(i) and upstream of D for compressing the streams W(i).

It is preferred that the unit of the present invention further comprises at least one condensate drum (second condensate drum CD(2)) for a liquid stream removed from V(2) and optionally from V(3) and further comprising means for passing at least part of the liquid contained in said drum as the stream T(3) to the top of D. According to the present invention, it is preferred that the unit further comprises at least one (first) condensate drum CD(1) for the condensed stream removed from intermediate reboiler V(1a) and bottom reboiler V(1b), the unit more preferably further comprising means for passing at least part of a gas phase obtained in said first condensate drum CD(2) to V(2) and means for passing at least part of a liquid phase obtained in said first condensate drum CD(1) to a second condensate drum CD(2) as defined in the foregoing.

In the context of the present invention, it is also conceivable that suitable reactive distillation columns K(i) are essentially bubble cap tray, valve tray and sieve tray columns. Specifically in the case of valve trays and sieve trays, the trays should be configured so that the raining-through of the liquid is minimized. A person skilled in the art will be familiar with the constructional measures required for this. It is also conceivable that the columns are provided with random packing elements or structured packings, with structured packings being preferred over random packing elements with a view to uniform distribution of the liquid.

Further, it may be preferred that the unit further comprises means for separating an alkali metal methoxide A(i)OMe from at least one of the streams P(i). Preferably, the number of reactive distillation columns K(i), n, is in the range of from 2 to 10, more preferably in the range of from 2 to 5, more preferably 2 or 3, more preferably 2.

3rd aspect – Use

In a third aspect, the invention relates to the use of a chemical production unit according to the second aspect of the invention described above or of a process according to the first aspect of the invention described above for simultaneously producing n mixtures $P(i)$ comprising alkali metal methoxide and methanol, n being an integer with $n \geq 2$ and $i = 1 \dots n$, wherein
5 either at least 2 of the mixtures $P(i)$ comprise different alkali metal methoxides $A(i)OMe$, and/or at least 2 of the mixtures $P(i)$ comprise the same alkali metal alkoxide $A(i)OMe$ at different concentrations.

10 All details, embodiments and preferred embodiments described above in the section related to the first aspect of the invention or in the section related to the second aspect of the invention also apply for the third aspect of the invention.

The present invention is further illustrated by the following set of embodiments and combinations of embodiments resulting from the dependencies and back-references as indicated. In particular, it is noted that in each instance where a range of embodiments is mentioned, for example in the context of a term such as "The process of any one of embodiments 1 to 4", every embodiment in this range is meant to be explicitly disclosed for the skilled person, i.e. the wording of this term is to be understood by the skilled person as being synonymous to "The process of
15 any one of embodiments 1, 2, 3 and 4". Further, it is explicitly noted that the following set of embodiments is not the set of claims determining the extent of protection, but represents a suitably structured part of the description directed to general and preferred aspects of the present invention.

25 1. An integrated process for simultaneously preparing n mixtures $P(i)$ comprising alkali metal methoxide and methanol, comprising
providing n reactive distillation columns $K(i)$;
providing n aqueous liquid streams $H(i)$, a given stream $H(i)$ comprising a dissolved alkali metal hydroxide $A(i)OH$, wherein n is an integer with $n \geq 2$ and $i = 1 \dots n$; and
30 providing a rectification column D comprising at least one reboiler $V(1a)$;
wherein the process comprises preparing the one or more alkali metal methoxides in the n reactive distillation column $K(i)$ under reactive distillation conditions from the n streams $H(i)$ and n streams $G(i)$ comprising methanol, thereby obtaining n top streams $W(i)$ comprising methanol and water; and obtaining n bottoms streams $P(i)$ comprising alkali metal
35 methoxide $A(i)OMe$ and methanol;
the process further comprising
(a) obtaining a vapor phase V comprising methanol at the top of the rectification column D , said vapor phase V having a pressure p_v and a temperature T_v ;

- (b) preparing at least two streams from the vapor phase V, comprising a vapor stream G having a pressure p_G and a temperature T_G with $0.95 \leq p_G/p_V \leq 1.00$, and further comprising a stream T(1a), said stream T(1a) having a pressure $p_{T(1a)}$ and a temperature $T_{T(1a)}$ with $p_{T(1a)} > p_V$ and $T_{T(1a)} > T_V$;
- 5 (c) preparing the n streams G(i) from the vapor stream G, each of the streams G(i) having a pressure $p_{G(i)}$ and a temperature $T_{G(i)}$ with $p_{G(i)} > p_G$ for each stream G(i); and feeding each stream G(i) into the respective reactive distillation column K(i);
- (d) passing at least a part of the stream T(1a) as a heating medium through the reboiler V(1a) of the rectification column D, obtaining a, preferably at least partially con-
- 10 densed, stream T_c(1a) having a temperature $T_{Tc(1a)}$ with $T_{Tc(1a)} < T_{T(1a)}$;
- (e) feeding at least a part of the stream T_c(1a) into the rectification column D;
- (f) feeding at least a first stream W(1) and a second stream W(2) at least partially into the rectification column D, comprising
- (f.1) feeding at least a part of the stream W(1) into the lower part of the rectification
- 15 column D at a position I(1);
- (f.2) feeding at least a part of the stream W(2) into the lower part of the rectification column D at a position I(2), wherein the position I(2) is located below the position I(1);
- wherein between the positions I(1) and I(2), the rectification column D is equipped
- 20 with internals.
2. The process of any one of embodiment 1, wherein below the position I(2) the rectification column D is equipped with internals.
- 25 3. The process of any one of embodiments 1 or 2, wherein the rectification column D's internals are selected from tray, unstructured (random) packing, structured packing and mixtures of two or more thereof.
4. The process of any one of embodiments 1 to 3, wherein the rectification column D has in
- 30 the range of from 20 to 100, preferably in the range of from 30 to 80, more preferably in the range of from 40 to 60 theoretical trays.
5. The process of embodiment 4, wherein position I(2) is located in the lower half of rectification column D, preferably third of rectification column D, wherein more preferably I(2) is
- 35 located between the 4th and the 20th theoretical stage, more preferably between the 5th and the 15th theoretical stage, more preferably between the 5th and the 12th theoretical stage of the rectification column D, counted from the bottom.

6. The process of embodiment 4 or 5, wherein position I(1) is located in the lower half of rectification column D, preferably in the lower third of rectification column D, wherein more preferably in the range of from 1 to 15 preferably of from 2 to 10, more preferably of from 3 to 5, theoretical trays are present between the position I(2) and I(1).
- 5
7. The process of any one of embodiments 1 to 6, further comprising for n reactive distillation columns K(i), feeding the stream G(i) into the lower part of the reactive distillation column K(i) and feeding the aqueous liquid stream H(i) into the upper part of the reactive distillation column K(i).
- 10
8. The process of any one of embodiments 1 to 7, wherein prior to preparing the n streams G(i) from the vapor stream G according to (c), the stream G is passed through a compressor C_G, thereby obtaining a compressed stream G_c having a pressure $p_{G_c} > p_G$.
- 15
9. The process of any one of embodiments 1 to 7, wherein prior to be fed into the reactive distillation column K(i), each of the n streams G(i) is passed through a compressor C(i), thereby obtaining n compressed streams G_{c(i)} having a pressure $p_{G_{c(i)}} > p_G$.
- 20
10. The process of any one of embodiments 1 to 9, wherein n = 2.
- 25
11. The process of embodiment 10, wherein the stream H(1) comprises dissolved sodium hydroxide and the stream H(2) comprises dissolved potassium hydroxide, wherein sodium methoxide is prepared in the reactive distillation column K(1) from which the stream W(1) is obtained and potassium methoxide is prepared in the reactive distillation column K(2) from which the stream W(2) is obtained.
- 30
12. The process of embodiment 11, wherein the stream W(1) comprises methanol and water at a molar methanol-to-water ratio r(1) and wherein the stream W(2) comprises methanol and water at a molar methanol-to-water ratio r(2) with $r(2) < r(1)$.
- 35
13. The process of any one of embodiments 1 to 12, further comprising feeding a stream M comprising methanol into the rectification column D at a position I(M).
14. The process of embodiment 13, wherein the positions I(1) and I(2) are located below the position I(M).

15. The process of embodiment 14, wherein I(M) is in the upper half of rectification column D, preferably in the upper third of rectification column D; and I(1) and I(2) are located in the lower half of rectification column D.
- 5 16. The process of any one of embodiments 1 to 15, wherein the rectification column D is operated at a pressure at the top of D in the range of from 0.5 to 10 bar(abs), preferably in the range of from 0.75 to 6 bar(abs), more preferably in the range of from 1 to 5 bar(abs), more preferably in the range of from 1 to 3 bar(abs).
- 10 17. The process of any one of embodiments 1 to 16, wherein the rectification column D is operated at a temperature at the top of D in the range of from 45 to 137 °C, preferably in the range of 49 to 118, more preferably in the range of from 64 to 111 °C, more preferably in the range of from 64 to 95°C.
- 15 18. The process of any one of embodiments 1 to 17, wherein the rectification column D is operated without top vapor recompression.
19. The process of any one of embodiments 1 to 17, wherein the rectification column D is operated at a reflux ratio of at least 0.5:1, preferably in the range of from 0.55:1 to 1.4:1, ore
20 preferably in the range of from 0.6:1 to 1.4:1.
20. The process of embodiment 19, wherein the rectification column is operated with top vapor recompression.
- 25 21. The process of embodiment 20, wherein realizing the reflux ratio comprises preparing from the vapor phase V a further vapor stream T(2), passing said stream T(2) through a condenser V(2), obtaining a liquid stream T(3) and a waste gas stream T(2w), and feeding the liquid stream T(3) into the top of the rectification column D.
- 30 22. The process of embodiment 21, wherein the waste gas stream T(2w) essentially consists of oxygen, nitrogen, carbon dioxide and methanol, wherein the amount of methanol in T(2w) is preferably in the range of from 2 to 80 weight-%, preferably in the range of from 10 to 30 weight-% based on the total weight of T(2w).
- 35 23. The process of embodiment 21 or 22, wherein at least a part of T_c(1a) is fed to a condensate drum CD(1), wherein from said condensate drum CD(1), a gas stream T(1g) and a liquid stream T(1l) are removed, said gas stream T(1g) being fed into the condenser V(2) together with T(2) and said liquid stream T(1l) being combined with the liquid streams

T(2l) and (T2gl) in depressurized form, obtaining a combined liquid stream which is fed as the stream T(3) into the top of the rectification column D.

24. The process of any one of embodiments 1 to 23, wherein vapor phase V has a pressure p_V , in the range of from 0.5 to 10 bar(abs), preferably in the range of from 0.75 to 6 bar(abs), more preferably in the range of from 1 to 5 bar(abs), more preferably in the range of from 1 to 3 bar(abs).
25. The process of any one of embodiments 1 to 24, wherein vapor phase V has a temperature T_V in the range of from 45 to 137 °C, preferably in the range of 49 to 118, more preferably in the range of from 64 to 111 °C, more preferably in the range of from 64 to 95°C .
26. The process of any one of embodiments 1 to 25, wherein a stream T(Di) having a temperature $T_{T(Di)}$ and a pressure $p_{T(Di)}$ is taken from the rectification column D and passed for heating purpose through the reboiler V(1a) of the rectification column D, obtaining a heated stream $T_h(Di)$ having a temperature $T_{Th(Di)}$ with $T_{Th(Di)} > T_{T(Di)}$, wherein heated stream $T_h(Di)$ is reintroduced into rectification column D.
27. The process of embodiment 26, wherein V(1a) is an intermediate reboiler of the rectification column D and the stream T(Di) is preferably taken at an intermediate position from rectification column D.
28. The process of any one of embodiments 1 to 27, wherein preparing the at least two streams according to (b) comprises
 - (b.1) splitting the vapor phase V into at least two vapor streams comprising the stream G and a vapor stream T(1) having a pressure $p_{T(1)}$ and a temperature $T_{T(1)}$ with $0.95 \leq p_{T(1)}/p_V \leq 1.00$;
 - (b.2) preparing at least stream T(1a) from the vapor stream T(1), wherein for preparing the stream T(1a) a first compression unit $C_{T(1)}$ is employed.
29. The process of embodiment 27 or 28, wherein stream T(1a) has a pressure $p_{T(1a)}$, which is adjusted so that $T_{condT(1a)} \geq T_{boilT(Di)} + 3 \text{ K}$, wherein $T_{condT(1a)}$ is the condensation temperature of stream T(1a) at a pressure $p_{T(1a)}$ and $T_{boilT(Di)}$ is the boiling temperature of stream T(Di) at a pressure $p_{T(Di)}$.
30. The process of any one of embodiments 27 to 29, wherein stream T(1a) has a condensation temperature $T_{condT(1a)}$ which is in the range of from 3 to 30 K, preferably in the range of from 4 and 25 K, more preferably in the range of from 5 and 20 K, higher than $T_{boilT(Di)}$.

31. The process of any one of embodiments 1 to 30, wherein the rectification column D comprises at least one reboiler V(1a) and at least one reboiler V(1b) and wherein the at least one reboiler V(1a) is an intermediate reboiler and the at least one reboiler V(1b) is a bottom reboiler;
- 5 wherein (b) comprises preparing at least three streams from the vapor phase V, comprising the vapor stream G having a pressure p_G and a temperature T_G with $0.95 \leq p_G/p_V \leq 1.00$, and further comprising two streams T(1a) and T(1b), said stream T(1a) having a pressure $p_{T(1a)}$ and a temperature $T_{T(1a)}$ with $p_{T(1a)} > p_V$ and $T_{T(1a)} > T_V$ and said stream
- 10 T(1b) having a pressure $p_{T(1b)}$ and a temperature $T_{T(1b)}$ with $p_{T(1b)} > p_V$ and $T_{T(1b)} > T_V$; wherein (d) comprises
- (d.1) passing at least a part of the stream T(1a) as a heating medium through a reboiler V(1a), preferably an intermediate reboiler V(1a), of the rectification column D, obtaining a stream $T_{C(1a)}$ having a temperature $T_{T_{C(1a)}}$ with $T_{T_{C(1a)}} < T_{T(1a)}$;
- 15 (d.2) passing at least a part of the stream T(1b) as a heating medium through a reboiler V(1b), preferably a bottom reboiler V(1a), of the distillation column D, obtaining a stream $T_{C(1b)}$ having a temperature $T_{T_{C(1b)}}$ with $T_{T_{C(1b)}} < T_{T(1b)}$; and
- wherein (e) comprises
- (e.1) feeding at least a part of the stream $T_{C(1a)}$ into the rectification column D;
- 20 (e.2) feeding at least a part of the stream $T_{C(1b)}$ into the rectification column D.
32. The process of embodiment 31, wherein preparing the at least three streams according to (b) comprises
- (b.1) splitting the vapor phase V into at least two vapor streams comprising the stream G
- 25 and a vapor stream T(1) having a pressure $p_{T(1)}$ and a temperature $T_{T(1)}$ with $0.95 \leq p_{T(1)}/p_V \leq 1.00$;
- (b.2) preparing at least the two streams T(1a) and T(1b) from the vapor stream T(1).
33. The process of embodiment 31 or 32,
- 30 wherein a stream T(Di) is taken from the rectification column D at an intermediate position and passed for heating purpose through an intermediate reboiler V(1a) of the rectification column D, obtaining a heated stream $T_h(Di)$ having a temperature $T_{T_h(Di)}$ with $T_{T_h(Di)} > T_{T(Di)}$, wherein heated stream $T_h(Di)$ is reintroduced into rectification column D; and
- wherein a stream T(Db) is taken from the rectification column D at a bottom position and
- 35 passed for heating purpose through the bottom reboiler V(1b) of the rectification column D, obtaining a stream $T_h(Db)$ having a temperature $T_{T_h(Db)}$ with $T_{T_h(Db)} > T_{T(Db)}$, wherein heated stream $T_h(Db)$ is reintroduced into rectification column D.

34. The process of any one of embodiments 31 to 33, wherein stream T(1b) has a pressure $p_{T(1b)}$, which is adjusted so that $T_{\text{cond}T(1b)}$ is $\geq T_{\text{boil}T(\text{Db})} + 3 \text{ K}$, wherein $T_{\text{cond}T(1b)}$ is the condensation temperature of stream T(1b) at a pressure $p_{T(1b)}$ and $T_{\text{boil}T(\text{Db})}$ is the boiling temperature of stream T(Db) at a pressure $p_{T(\text{Db})}$.
- 5
35. The process of any one of embodiments 31 to 34, wherein T(1b) has a condensation temperature $T_{\text{cond}T(1b)}$ which is in the range of from 3 to 30 K, preferably in the range of from 4 and 25 K, more preferably in the range of from 5 and 20 K, higher than $T_{\text{boil}T(\text{Db})}$.
- 10 36. A chemical production unit for carrying out the process according to any one of embodiments 1 to 35, comprising
- a rectification column D comprising
 - in its lower part, inlet means for feeding streams W(i) or one or more combined stream thereof into D;
 - 15 -- in its upper part, outlet means for removing a vapor stream V or divided streams thereof, comprising at least a gaseous stream G and at a stream T(1a), from the top of D;
 - at least one reboiler V(1a);
 - optionally a stream dividing device S_o for dividing V or substreams of V into (further) 20 sub streams thereof;
 - a first compressor $C_T(1)$ for compressing T(1a) or a part thereof;
 - means for passing compressed sub streams of T(1) from $C_T(1)$ as heating medium through reboiler V(1a);
 - 25 - a stream dividing device S for dividing the stream G into n streams G(i);
 - means for passing the stream G to said stream dividing device S;
 - n reactive distillation columns K(i), $n \geq 2$ and $i = 1 \dots n$; said reactive distillation columns K(i) being arranged in parallel, each reactive distillation column K(i) comprising
 - 30 -- in its upper part, preferably in its top, inlet means for feeding a stream H(i) into K(i);
 - in its lower part, inlet means for feeding a stream G(i) into K(i);
 - outlet means for removing a stream W(i) from the top of K(i);
 - a bottom reboiler;
 - outlet means for removing a bottoms stream from K(i);
 - 35 -- a stream dividing means for separating a stream P(i) from the bottoms stream removed from K(i);
 - means for passing the streams G(i) to the reactive distillation columns K(i);

- spatially separated means for passing at least one of the streams $W(i)$ and at least another one of the streams $W(i)$ at different positions to the rectification column D ;
 - one or more compressors $C(i)$ for compressing either the stream G and/or the streams $G(i)$ and/or the streams $W(i)$.
37. The chemical production unit of embodiment 36, comprising an intermediate reboiler $V(1a)$ and a bottom reboiler $V(1b)$, further comprising a second compressor $C_T(2)$ for compressing $T(1b)$; means for passing compressed sub streams of $T(1)$ from $C_T(2)$ as heating medium through bottom reboiler $V(1b)$.
38. The chemical production unit of embodiment 36 or 37 comprising means for passing condensed sub streams of $T(1a)$ and optionally of $T(1b)$ after passage through intermediate reboiler $V(1a)$ and optionally through bottom reboiler $V(1b)$ into D , the means preferably comprising
- at least one condenser, preferably a condenser $V(2)$ and optionally a further condenser $V(3)$ arranged downstream of $V(2)$, having inlet means for receiving condensed stream of $T(1a)$ after passage through intermediate reboiler $V(1a)$ and optionally condensed stream $T(1b)$ after passage through bottom reboiler $V(1b)$, and having outlet means for removing a condensed stream $T(3)$ and for removing a waste gas stream;
 - inlet means for feeding the stream $T(3)$ to the top of D .
39. The chemical production unit of any one of embodiments 36 to 38 comprising inlet means for feeding a methanol stream M into D .
40. Use of a chemical production unit according to any one of embodiments 36 to 39 or of a process according to any one of embodiments 1 to 35 for simultaneously producing n mixtures $P(i)$ comprising alkali metal methoxide and methanol, n being an integer with $n \geq 2$ and $i = 1 \dots n$, wherein
- either at least 2 of the mixtures $P(i)$ comprise different alkali metal methoxides $A(i)OMe$, and/or at least 2 of the mixtures $P(i)$ comprise the same alkali metal alkoxide $A(i)OMe$ at different concentrations.
- The present invention is further illustrated by the following reference examples, comparative examples, and examples.

Examples

1. Reference Example 1: Simultaneous production of sodium methoxide and potassium methoxide without top vapor recompression in rectification column D

Fig. 2 shows a process scheme for preparing a mixture P(1) comprising NaOMe and MeOH and a mixture P(2) comprising KOMe and MeOH according to Reference Example 1. Regarding the operating conditions of the distillation column D and of the reactive distillation columns K(1) and K(2), reference is made to Table 1a below. Regarding the relative mass flow rates, reference is made to Table 1b below.

Table 1a
Operating conditions of the columns D, K(1) and K(2)

Column D	Pressure at the top / bar(abs)	2.1
	Temperature at the top / °C	84
	Pressure at the bottom / bar(abs)	2.23
	Temperature at the bottom / °C	124
	Theoretical stages	50
	W(1), W(2) to theoretical stage from bottom	8th
	M fed to theoretical stage from bottom	42th
Column K(1)	Pressure at the top / bar(abs)	2.15
	Temperature at the top / °C	89
	Pressure at the bottom / bar(abs)	2.3
	Temperature at the bottom / °C	117
	Number of trays	40
Column K(2)	Pressure at the top / bar(abs)	2.15
	Temperature at the top / °C	89
	Pressure at the bottom / bar(abs)	2.3
	Temperature at the bottom / °C	116
	Number of trays	40

Table 1b
Relationships between the mass flow rates f of the different streams

Definition of streams	Specified:	H(1), H(2)
	M(1), M(2):	part of condensate from V(2)

	H(1):	NaOH 50 weight-% in water
	H(2):	KOH 48 weight-% in water
Ratios of mass flow rates of streams	$f(G(1)) / f(H(1))$	13.3
	$f(G(2)) / f(H(2))$	9.03
	$f(M(1)) / f(H(1))$	0.55
	$f(M(2)) / f(H(2))$	0.40
	$f(T(3)) / f(G) *$	0.92
	$f(P(1)) / f(H(1))$	2.25
	$f(P(2)) / f(H(2))$	1.86
	$f(\text{waste gas}) / f(G) *$	< 0.0015

*) $f(G) = f(G(1)) + f(G(2))$

P(1): 30 weight-% of sodium methoxide in methanol, < 1000 ppm of water.

P(2): 32 weight-% of potassium methoxide in methanol, < 1000 ppm of water.

5

In the following, it is indicated how the mass flow rate of the methanol contained in the stream M (methanol balance, fresh methanol stream), $f_{\text{MeOH}}(M)$, is calculated. In this calculation, the water contents of P(1) and P(2), both being less than 1000 weight-ppm, are neglected. According to this calculation, $f_{\text{MeOH}}(P(1))$ is the mass flow rate of MeOH contained in the stream P(1),

10 $f_{\text{MeOH}}(P(2))$ is the mass flow rate of MeOH contained in the stream P(2), $f_{\text{MeOH}}(\text{water})$ is the mass flow rate of MeOH contained in the water stream, and $f_{\text{MeOH}}(\text{waste gas})$ is the mass flow rate of MeOH contained in the waste gas stream:

$$f_{\text{MeOH}}(M) = f_{\text{MeOH}}(P(1)) + f_{\text{MeOH}}(P(2)) + f_{\text{MeOH}}(\text{water}) + f_{\text{MeOH}}(\text{waste gas})$$

15

$$1.1 \quad f_{\text{MeOH}}(P(1)) = [(1 - C_{\text{NaOMe}}) * f(P(1))] + [(M_{\text{MeOH}}/M_{\text{NaOH}} * C_{\text{NaOH}}) * f(H(1))]$$

Molecular mass M / concentration c	values	units
M_{MeOH}	32	kg/kmol
M_{NaOH}	40	kg/kmol
C_{NaOH} in H(1)	0.5	kg/kg
C_{NaOMe} in P(1)	0.3	kg/kg

$$1.2 \quad f_{\text{MeOH}}(P(2)) = [(1 - C_{\text{KOMe}}) * f(P(2))] + [(M_{\text{MeOH}}/M_{\text{KOH}} * C_{\text{KOH}}) * f(H(2))]$$

20

Molecular mass M / concentration c	values	units
M_{MeOH}	32	kg/kmol
M_{KOH}	56	kg/kmol
c_{KOH} in H(2)	0.48	kg/kg
c_{KOME} in P(2)	0.32	kg/kg

1.3 $f_{\text{MeOH}}(\text{water}) = 0.001 * f(\text{water})$ (maximum value)

1.4 $f_{\text{MeOH}}(\text{waste gas}) = 0$ (neglected)

5

In the following, it is indicated how the mass flow rate of the water contained in the stream water (bottom stream of D, waste water stream), $f(\text{water})$, is calculated. In this calculation, the water contents of P(1) and P(2), both being less than 1000 weight-ppm, are neglected.

10 1.5 $f(\text{water}) = f_{\text{H}_2\text{O}}(\text{H}(1)) + f_{\text{H}_2\text{O}}(\text{H}(2)) + f_{\text{H}_2\text{O}}(\text{M}) - f_{\text{H}_2\text{O}}(\text{waste gas})$

$f_{\text{H}_2\text{O}}(\text{H}(1))$ is the mass flow rate of water contained in the stream H(1) and $f_{\text{H}_2\text{O}}(\text{H}(2))$ is the mass flow rate of water contained in the stream H(2) and $f_{\text{H}_2\text{O}}(\text{M})$ is the mass flow rate of water contained in the stream M:

15

1.5.1 $f_{\text{H}_2\text{O}}(\text{H}(1)) = [(1 - c_{\text{NaOH}}) * f(\text{H}(1))] + [(M_{\text{H}_2\text{O}}/M_{\text{NaOH}} * c_{\text{NaOH}}) * f(\text{H}(1))]$

Molecular mass M / concentration c	values	units
$M_{\text{H}_2\text{O}}$	18	kg/kmol
M_{NaOH}	40	kg/kmol
c_{NaOH} in H(1)	0.5	kg/kg

1.5.2 $f_{\text{H}_2\text{O}}(\text{H}(2)) = [(1 - c_{\text{KOH}}) * f(\text{H}(2))] + [(M_{\text{H}_2\text{O}}/M_{\text{KOH}} * c_{\text{KOH}}) * f(\text{H}(2))]$

20

Molecular mass M / concentration c	values	units
$M_{\text{H}_2\text{O}}$	18	kg/kmol
M_{KOH}	56	kg/kmol
c_{KOH} in H(2)	0.48	kg/kg

1.5.3 $f_{\text{H}_2\text{O}}(\text{M}) = 0.001 * f(\text{M})$

1.5.4 $f_{H_2O}(\text{waste gas}) = 0$ (neglected)

2. Reference Example 2: Simultaneous production of sodium methoxide and potassium methoxide with top vapor recompression (first compression unit) for intermediate reboiler in rectification column D

Fig. 3 shows a process scheme for preparing a mixture P(1) comprising NaOMe and MeOH and a mixture P(2) comprising KOMe and MeOH according to Reference Example 2. Regarding the operating conditions of the rectification column D and of the reactive distillation columns K(1) and K(2), reference is made to Table 2a below. Regarding the relative mass flow rates, reference is made to Table 2b below.

The use of vapor recompression reduces the energy demand of the distillation in rectification column D considerably. It is possible to have a ratio of the heat streams to V(1b) and V(1a) of about 1:4. That means, the energy demand decreases to 20 %. But about 10 % (depending on the pressure) of the energy which is transferred in V(1a) is needed as power for the compressor C_T(1). All in all, there is already some energy saving by using vapor recompression.

Table 2a
Operating conditions of the columns D, K(1) and K(2)

Column D	Pressure at the top / bar(abs)	2.1
	Temperature at the top / °C	84
	Pressure at the bottom / bar(abs)	2.23
	Temperature at the bottom / °C	124
	Theoretical stages	50
	W(1), W(2) to theoretical stage from bottom	8th
	M fed to theoretical stage from bottom	42th
	Pressure at outlet of C _T (1) / bar(abs)	5
Column K(1)	Pressure at the top / bar(abs)	2.15
	Temperature at the top / °C	89
	Pressure at the bottom / bar(abs)	2.3
	Temperature at the bottom / °C	117
	Number of trays	40

Column K(2)	Pressure at the top / bar(abs)	2.15
	Temperature at the top / °C	89
	Pressure at the bottom / bar(abs)	2.3
	Temperature at the bottom / °C	116
	Number of trays	40

Table 2bRelationships between the mass flow rates f of the different streams

Definition of streams	Specified:	H(1), H(2)
	M(1), M(2):	part of condensate from V(2)
	H(1):	NaOH 50 weight-% in water
	H(2):	KOH 48 weight-% in water
Ratios of mass flow rates of streams	$f(G(1)) / f(H(1))$	13.3
	$f(G(2)) / f(H(2))$	9.03
	$f(M(1)) / f(H(1))$	0.55
	$f(M(2)) / f(H(2))$	0.40
	$f(T(3)) / f(G) *$	1.0
	$f(P(1)) / f(H(1))$	2.25
	$f(P(2)) / f(H(2))$	1.86
	$f(\text{waste gas}) / f(G) *$	< 0.0015
	$f(T(1)) / f(T(2))$	3.97

*) $f(G) = f(G(1)) + f(G(2))$

5

P(1): 30 weight-% of sodium methoxide in methanol, < 1000 ppm of water.

P(2): 32 weight-% of potassium methoxide in methanol, < 1000 ppm of water.

In the following, it is indicated how the mass flow rate of the methanol contained in the stream M (methanol balance, fresh methanol stream), $f_{\text{MeOH}}(M)$, is calculated. In this calculation, the water contents of P(1) and P(2), both being less than 1000 weight-ppm, are neglected. According to this calculation, $f_{\text{MeOH}}(P(1))$ is the mass flow rate of MeOH contained in the stream P(1), $f_{\text{MeOH}}(P(2))$ is the mass flow rate of MeOH contained in the stream P(2), $f_{\text{MeOH}}(\text{water})$ is the mass flow rate of MeOH contained in the water stream, and $f_{\text{MeOH}}(\text{waste gas})$ is the mass flow rate of MeOH contained in the waste gas stream:

$$f_{\text{MeOH}}(M) = f_{\text{MeOH}}(P(1)) + f_{\text{MeOH}}(P(2)) + f_{\text{MeOH}}(\text{water}) + f_{\text{MeOH}}(\text{waste gas})$$

$$2.1 \quad f_{\text{MeOH}}(\mathbf{P(1)}) = [(1 - C_{\text{NaOMe}}) * f(\mathbf{P(1)})] + [(M_{\text{MeOH}}/M_{\text{NaOH}} * C_{\text{NaOH}}) * f(\mathbf{H(1)})]$$

Molecular mass M / concentration c	values	units
M_{MeOH}	32	kg/kmol
M_{NaOH}	40	kg/kmol
C_{NaOH} in H(1)	0.5	kg/kg
C_{NaOMe} in P(1)	0.3	kg/kg

$$2.2 \quad f_{\text{MeOH}}(\mathbf{P(2)}) = [(1 - C_{\text{KOME}}) * f(\mathbf{P(2)})] + [(M_{\text{MeOH}}/M_{\text{KOH}} * C_{\text{KOH}}) * f(\mathbf{H(2)})]$$

5

Molecular mass M / concentration c	values	units
M_{MeOH}	32	kg/kmol
M_{KOH}	56	kg/kmol
C_{KOH} in H(2)	0.48	kg/kg
C_{KOME} in P(2)	0.32	kg/kg

$$2.3 \quad f_{\text{MeOH}}(\mathbf{water}) = 0.001 * f(\mathbf{water}) \text{ (maximum value)}$$

$$2.4 \quad f_{\text{MeOH}}(\mathbf{waste gas}) = 0 \text{ (neglected)}$$

10

In the following, it is indicated how the mass flow rate of the water contained in the stream water (bottom stream of D, waste water stream), $f(\mathbf{water})$, is calculated. In this calculation, the water contents of P(1) and P(2), both being less than 1000 weight-ppm, are neglected.

$$15 \quad 2.5 \quad f(\mathbf{water}) = f_{\text{H}_2\text{O}}(\mathbf{H(1)}) + f_{\text{H}_2\text{O}}(\mathbf{H(2)}) + f_{\text{H}_2\text{O}}(\mathbf{M}) - f_{\text{H}_2\text{O}}(\mathbf{waste gas})$$

$f_{\text{H}_2\text{O}}(\mathbf{H(1)})$ is the mass flow rate of water contained in the stream H(1) and $f_{\text{H}_2\text{O}}(\mathbf{H(2)})$ is the mass flow rate of water contained in the stream H(2) and $f_{\text{H}_2\text{O}}(\mathbf{M})$ is the mass flow rate of water contained in the stream M:

20

$$2.5.1 \quad f_{\text{H}_2\text{O}}(\mathbf{H(1)}) = [(1 - C_{\text{NaOH}}) * f(\mathbf{H(1)})] + [(M_{\text{H}_2\text{O}}/M_{\text{NaOH}} * C_{\text{NaOH}}) * f(\mathbf{H(1)})]$$

Molecular mass M / concentration c	values	units
$M_{\text{H}_2\text{O}}$	18	kg/kmol

M _{NaOH}	40	kg/kmol
c _{NaOH} in H(1)	0.5	kg/kg

2.5.2 $f_{H_2O}(H(2)) = [(1 - c_{KOH}) * f(H(2))] + [(M_{H_2O}/M_{KOH} * c_{KOH}) * f(H(2))]$

Molecular mass M / concentration c	values	units
M _{H₂O}	18	kg/kmol
M _{KOH}	56	kg/kmol
c _{KOH} in H(2)	0.48	kg/kg

5 2.5.3 $f_{H_2O}(M) = 0.001 * f(M)$

2.5.4 $f_{H_2O}(\text{waste gas}) = 0$ (neglected)

3. Example 1: (f.1) Feeding W(1) into rectification column D at a position I(1) combined
10 with feeding the stream W(2) into rectification column D at a position
I(2)

As shown in Fig. 4, the stream W(1) was fed into the lower part of the rectification column D at a
position I(1) and the stream W(2) was fed into the lower part of the rectification column D at a
15 position I(2), wherein the position I(2) was located below the position I(1) and the rectification
column D was equipped with internals between the positions I(1) and I(2).

The use of vapor recompression reduces the energy demand of the distillation in rectification
column D considerably. It was possible to have a ratio of the heat streams to V(1b) and V(1a) of
20 about 1:4. That means, the energy demand decreased to 20 %. But about 10 % (depending on
the pressure) of the energy which was transferred in V(1a) was needed as power for the com-
pressor C_T(1). All in all, there was a large energy saving by using vapor recompression.

The advantage in comparison to Reference Example 2 was a smaller water concentration (mi-
nus 11%) at the top of the rectification column D and this resulted in a better product quality of
25 the sodium methylate solution (water concentration in sodium methylate solution decreased by
4.44% in relation to Reference Example 2) and also an at least equal product quality of the po-
tassium methylate solution in that the water content is not elevated but rather at least main-
tained about unchanged in relation to Reference Example 2.

Fig. 4 shows the process scheme for preparing a mixture P(1) comprising NaOMe and MeOH and a mixture P(2) comprising KOMe and MeOH. Regarding the operating conditions of the rectification column D and of the reactive distillation columns K(1) and K(2), reference is made to Table 3a below. Regarding the relative mass flow rates, reference is made to Table 3b below.

5

Table 3a

Operating conditions of the columns D, K(1) and K(2)

Column D	Pressure at the top / bar(abs)	2.1
	Temperature at the top / °C	84
	Pressure at the bottom / bar(abs)	2.23
	Temperature at the bottom / °C	124
	Theoretical stages	50
	W(1) to theoretical stage from bottom	11th
	W(2) to theoretical stage from bottom	8th
	M fed to theoretical stage from bottom	42th
	Pressure at outlet of C _T (1) / bar(abs)	5
Column K(1)	Pressure at the top / bar(abs)	2.15
	Temperature at the top / °C	89
	Pressure at the bottom / bar(abs)	2.3
	Temperature at the bottom / °C	117
	Number of trays	40
Column K(2)	Pressure at the top / bar(abs)	2.15
	Temperature at the top / °C	89
	Pressure at the bottom / bar(abs)	2.3
	Temperature at the bottom / °C	116
	Number of trays	40

Table 3b

10 Relationships between the mass flow rates *f* of the different streams

Definition of streams	Specified:	H(1), H(2)
	M(1), M(2):	part of condensate from V(2)
	H(1):	NaOH 50 weight-% in water
	H(2):	KOH 48 weight-% in water
Ratios of	$f(G(1)) / f(H(1))$	13.3

mass flow rates of streams	$f(G(2)) / f(H(2))$	9.03
	$f(M(1)) / f(H(1))$	0.55
	$f(M(2)) / f(H(2))$	0.40
	$f(T(3)) / f(G) \text{ *)}$	1.0
	$f(P(1)) / f(H(1))$	2.25
	$f(P(2)) / f(H(2))$	1.86
	$f(\text{waste gas}) / f(G) \text{ *)}$	< 0.0015
	$f(T(1)) / f(T(2))$	3.97

*) $f(G) = f(G(1)) + f(G(2))$

P(1): 30 weight-% of sodium methoxide in methanol, < 1000 ppm of water.

P(2): 32 weight-% of potassium methoxide in methanol, < 1000 ppm of water.

5

In the following, it is indicated how the mass flow rate of the methanol contained in the stream M (methanol balance, fresh methanol stream), $f_{\text{MeOH}}(M)$, was calculated. In this calculation, the water contents of P(1) and P(2), both being less than 1000 weight-ppm, were neglected. According to this calculation, $f_{\text{MeOH}}(P(1))$ was the mass flow rate of MeOH contained in the stream P(1),

10 $f_{\text{MeOH}}(P(2))$ was the mass flow rate of MeOH contained in the stream P(2), $f_{\text{MeOH}}(\text{water})$ was the mass flow rate of MeOH contained in the water stream, and $f_{\text{MeOH}}(\text{waste gas})$ was the mass flow rate of MeOH contained in the waste gas stream:

$$f_{\text{MeOH}}(M) = f_{\text{MeOH}}(P(1)) + f_{\text{MeOH}}(P(2)) + f_{\text{MeOH}}(\text{water}) + f_{\text{MeOH}}(\text{waste gas})$$

15

$$3.1 \quad f_{\text{MeOH}}(P(1)) = [(1 - C_{\text{NaOMe}}) * f(P(1))] + [(M_{\text{MeOH}}/M_{\text{NaOH}} * C_{\text{NaOH}}) * f(H(1))]$$

Molecular mass M / concentration c	values	units
M_{MeOH}	32	kg/kmol
M_{NaOH}	40	kg/kmol
C_{NaOH} in H(1)	0.5	kg/kg
C_{NaOMe} in P(1)	0.3	kg/kg

$$3.2 \quad f_{\text{MeOH}}(P(2)) = [(1 - C_{\text{KOME}}) * f(P(2))] + [(M_{\text{MeOH}}/M_{\text{KOH}} * C_{\text{KOH}}) * f(H(2))]$$

20

Molecular mass M / concentration c	values	units
M_{MeOH}	32	kg/kmol

M_{KOH}	56	kg/kmol
c_{KOH} in H(2)	0.48	kg/kg
c_{KOME} in P(2)	0.32	kg/kg

3.3 $f_{\text{MeOH}}(\text{water}) = 0.001 * f(\text{water})$ (maximum value)

3.4 $f_{\text{MeOH}}(\text{waste gas}) = 0$ (neglected)

5

In the following, it is indicated how the mass flow rate of the water contained in the stream water (bottom stream of D, waste water stream), $f(\text{water})$, was calculated. In this calculation, the water contents of P(1) and P(2), both being less than 1000 weight-ppm, were neglected.

10 3.5 $f(\text{water}) = f_{\text{H}_2\text{O}}(\text{H}(1)) + f_{\text{H}_2\text{O}}(\text{H}(2)) + f_{\text{H}_2\text{O}}(\text{M}) - f_{\text{H}_2\text{O}}(\text{waste gas})$

$f_{\text{H}_2\text{O}}(\text{H}(1))$ is the mass flow rate of water contained in the stream H(1) and $f_{\text{H}_2\text{O}}(\text{H}(2))$ is the mass flow rate of water contained in the stream H(2) and $f_{\text{H}_2\text{O}}(\text{M})$ is the mass flow rate of water contained in the stream M:

15

3.5.1 $f_{\text{H}_2\text{O}}(\text{H}(1)) = [(1 - c_{\text{NaOH}}) * f(\text{H}(1))] + [(M_{\text{H}_2\text{O}}/M_{\text{NaOH}} * c_{\text{NaOH}}) * f(\text{H}(1))]$

Molecular mass M / concentration c	values	units
$M_{\text{H}_2\text{O}}$	18	kg/kmol
M_{NaOH}	40	kg/kmol
c_{NaOH} in H(1)	0.5	kg/kg

3.5.2 $f_{\text{H}_2\text{O}}(\text{H}(2)) = [(1 - c_{\text{KOH}}) * f(\text{H}(2))] + [(M_{\text{H}_2\text{O}}/M_{\text{KOH}} * c_{\text{KOH}}) * f(\text{H}(2))]$

20

Molecular mass M / concentration c	values	units
$M_{\text{H}_2\text{O}}$	18	kg/kmol
M_{KOH}	56	kg/kmol
c_{KOH} in H(2)	0.48	kg/kg

3.5.3 $f_{\text{H}_2\text{O}}(\text{M}) = 0.001 * f(\text{M})$

3.5.4 $f_{\text{H}_2\text{O}}(\text{waste gas}) = 0$ (neglected)

25

Short description of the Figures

Fig. 1 shows a schematic overview of a process according to the present invention wherein a vapor phase V comprising methanol is obtained at the top of the rectification column D. From said vapor phase V, at least two streams are prepared, comprising a vapor stream G and further comprising a stream T(1a). The gas stream G, exhibiting a flow rate $f(G)$, is passed through a compressor C_G , and the thus compressed stream is then divided into two compressed streams G(1) and G(2), both having the same composition as G. The stream G(1) exhibits a flow rate $f(G(1))$, the stream G(2) exhibits a flow rate $f(G(2))$, wherein $f(G(1)) + f(G(2)) = f(G)$. The compressed stream G(1) is fed into the lower part of reactive distillation column K(1), wherein into the upper part of K(1), a liquid aqueous stream H(1) comprising a dissolved alkali metal hydroxide $A(1)OH$ is fed. K(1) is equipped with a bottom reboiler $V_K(1)$. The bottoms stream removed from the column K(1) is the mixture P(1) comprising alkali metal methoxide $A(1)OMe$ and methanol. From the top of the column K(1), which is operated without reflux, a gas stream W(1) essentially consisting of methanol and water is removed, wherein W(1) is fed into a lower part of the rectification column D. The compressed stream G(2) is then fed into the lower part of reactive distillation column K(2), wherein into the upper part of K(2), a liquid aqueous stream H(2) comprising a dissolved alkali metal hydroxide $A(2)OH$ is fed. K(2) is equipped with a bottom reboiler $V_K(2)$. The bottoms stream from K(2) is the mixture P(2) comprising alkali metal methoxide $A(2)OMe$ and methanol. From the top of the column K(2), which is operated without reflux, a gas stream W(2) essentially consisting of methanol and water is removed, wherein W(2) is fed, separated from W(1), into a lower part of the rectification column D. W(1) is fed into the lower part of the rectification column D at a position I(1) and stream W(2) is fed into the lower part of the rectification column D at a position I(2), wherein the position I(2) is located below the position I(1). The rectification column D is equipped with internals between the positions I(1) and I(2).

The stream T(1a) having a temperature $T_{T(1a)}$ is passed as a heating medium through an intermediate reboiler V(1a) of the rectification column D, thereby obtaining a condensed stream $T_C(1a)$ having a temperature $T_{T_C(1a)}$ with $T_{T_C(1a)} < T_{T(1a)}$ and stream $T_C(1a)$ is passed into the rectification column D as outlined in detail below and shown in the Figure. Intermediate reboiler V(1a) is supplemented by sump reboiler V(1b) at the bottom of rectification column D.

The realization of the reflux ratio for rectification column D is shown in the upper part of Fig. 1, wherein realizing the reflux ratio comprises preparing from the vapor phase V a further vapor stream T(2), passing said stream T(2) through a condenser V(2), obtaining a liquid stream T(3) and a waste gas stream T(2w), and feeding the liquid stream T(3) into the top of the rectification column D. Stream $T_C(1a)$ is fed to a first condensate drum CD(1), wherein from said first condensate drum CD(1), a gas stream T(1g) and a liquid stream T(1l) are removed, said gas stream T(1g) being fed into the condenser V(2) and said liquid stream T(1l) being combined

with the liquid streams T(2l) and (T2gl) in a second condensate drum CD(2) in depressurized form, obtaining a combined liquid stream which is fed as the stream T(3) into the top of the rectification column D.

5 **Fig. 2** shows a schematic overview of a comparative process, without compression units as used in Reference Example 1.

Fig. 3 shows a schematic overview of a comparative process, with only a first compression unit $C_T(1)$ as used in Reference Example 2. Everything is identical as described above
10 in detail for Fig. 1, with the difference that the gas stream G, exhibiting a flow rate $f(G)$, is first divided into two streams G(1) and G(2), which are then each passed through a compressor $C_G(1)$ and $C_G(2)$ respectively, and the thus compressed streams $G_c(1)$ and $G_c(2)$, both having the same composition as G are fed into the lower part of reactive distillation column K(1) and K(2) respectively. The further difference compared to Fig. 1 is that streams W(2) and W(1) are
15 feed into a lower part of the rectification column D, wherein the feeding is done separately but at about the same height of D1, without any physical separation between the feeding points. The remaining process is as described in Fig. 1 above.

Fig. 4 shows a schematic overview of the process of Example 1 as in Fig. 1, wherein
20 the stream W(1) is fed into the lower part of the rectification column D at a position I(1) and the stream W(2) is fed into the lower part of the rectification column D at a position I(2), wherein the position I(2) is located below the position I(1) and the rectification column D is equipped with internals between the positions I(1) and I(2). Contrary to Fig. 1 (but identical to Fig. 3), the stream G is not compressed in a compressor C_G but rather separated into two streams G(1) and G(2),
25 wherein each of G(1), G(2) is passed through a compressor $C_G(1)$, $C_G(2)$ before being passed into the respective reactive distillation column K(1), K(2). The remaining process is as described in Fig. 1 above.

Cited Literature

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Claims

1. An integrated process for simultaneously preparing n mixtures $P(i)$ comprising alkali metal methoxide and methanol, comprising
- 5 providing n reactive distillation columns $K(i)$;
providing n aqueous liquid streams $H(i)$, a given stream $H(i)$ comprising a dissolved alkali metal hydroxide $A(i)OH$, wherein n is an integer with $n \geq 2$ and $i = 1 \dots n$; and
providing a rectification column D comprising at least one reboiler $V(1a)$;
wherein the process comprises preparing the one or more alkali metal methoxides in the n reactive distillation column $K(i)$ under reactive distillation conditions from the n streams $H(i)$ and n streams $G(i)$ comprising methanol, thereby obtaining n top streams $W(i)$ comprising methanol and water; and obtaining n bottoms streams $P(i)$ comprising alkali metal methoxide $A(i)OMe$ and methanol;
the process further comprising
- 15 (a) obtaining a vapor phase V comprising methanol at the top of the rectification column D , said vapor phase V having a pressure p_V and a temperature T_V ;
(b) preparing at least two streams from the vapor phase V , comprising a vapor stream G having a pressure p_G and a temperature T_G with $0.95 \leq p_G/p_V \leq 1.00$, and further comprising a stream $T(1a)$, said stream $T(1a)$ having a pressure $p_{T(1a)}$ and a temperature $T_{T(1a)}$ with $p_{T(1a)} > p_V$ and $T_{T(1a)} > T_V$;
20 (c) preparing the n streams $G(i)$ from the vapor stream G , each of the streams $G(i)$ having a pressure $p_{G(i)}$ and a temperature $T_{G(i)}$ with $p_{G(i)} > p_G$ for each stream $G(i)$; and feeding each stream $G(i)$ into the respective reactive distillation column $K(i)$;
(d) passing at least a part of the stream $T(1a)$ as a heating medium through the reboiler $V(1a)$ of the rectification column D , obtaining a, preferably at least partially condensed, stream $T_C(1a)$ having a temperature $T_{T_C(1a)}$ with $T_{T_C(1a)} < T_{T(1a)}$;
25 (e) feeding at least a part of the stream $T_C(1a)$ into the rectification column D ;
(f) feeding at least a first stream $W(1)$ and a second stream $W(2)$ at least partially into the rectification column D , comprising
30 (f.1) feeding at least a part of the stream $W(1)$ into the lower part of the rectification column D at a position $I(1)$;
(f.2) feeding at least a part of the stream $W(2)$ into the lower part of the rectification column D at a position $I(2)$, wherein the position $I(2)$ is located below the position $I(1)$;
35 wherein between the positions $I(1)$ and $I(2)$, the rectification column D is equipped with internals.

2. The process of any one of claim 1, wherein below the position I(2) the rectification column D is equipped with internals.
3. The process of claim 1 or 2, wherein the rectification column D has in the range of from 20 to 100, preferably in the range of from 30 to 80, more preferably in the range of from 40 to 60 theoretical trays.
4. The process of claim 3, wherein position I(2) is located in the lower half of rectification column D, preferably in the lower third of rectification column D, wherein more preferably I(2) is located between the 4th and the 20th theoretical stage, more preferably between the 5th and the 15th theoretical stage, more preferably between the 5th and the 12th theoretical stage of the rectification column D, counted from the bottom.
5. The process of claim 3 or 4, wherein position I(1) is located in the lower half of rectification column D, preferably in the lower third of rectification column D, wherein more preferably in the range of from 1 to 15 preferably of from 2 to 10, more preferably of from 3 to 5, theoretical trays are present between the position I(2) and I(1).
6. The process of any one of claims 1 to 5, further comprising for n reactive distillation columns K(i), feeding the stream G(i) into the lower part of the reactive distillation column K(i) and feeding the aqueous liquid stream H(i) into the upper part of the reactive distillation column K(i).
7. The process of any one of claims 1 to 6, wherein a stream H(1) comprises dissolved sodium hydroxide and a stream H(2) comprises dissolved potassium hydroxide, wherein sodium methoxide is prepared in a reactive distillation column K(1) from which the stream W(1) is obtained and potassium methoxide is prepared in a reactive distillation column K(2) from which the stream W(2) is obtained.
8. The process of claim 7, wherein the stream W(1) comprises methanol and water at a molar methanol-to-water ratio $r(1)$ and wherein the stream W(2) comprises methanol and water at a molar methanol-to-water ratio $r(2)$ with $r(2) < r(1)$.
9. The process of any one of claims 1 to 8, further comprising feeding a stream M comprising methanol into the rectification column D at a position I(M).
10. The process of claim 9, wherein the positions I(1) and I(2) are located below the position I(M).

11. The process of claim 9 or 10, wherein I(M) is in the upper half of rectification column D, preferably in the upper third of rectification column D; and I(1) and I(2) are located in the lower half of rectification column D.
- 5
12. The process of any one of claims 1 to 11, wherein preparing the at least two streams according to (b) comprises
- (b.1) splitting the vapor phase V into at least two vapor streams comprising the stream G and a vapor stream T(1) having a pressure $p_{T(1)}$ and a temperature $T_{T(1)}$ with $0.95 \leq p_{T(1)}/p_V \leq 1.00$;
- 10
- (b.2) preparing at least stream T(1a) from the vapor stream T(1), wherein for preparing the stream T(1a) a first compression unit C_{T(1)} is employed.
13. The process of any one of claims 1 to 12, wherein the rectification column D comprises at least one reboiler V(1a) and at least one reboiler V(1b) and wherein the at least one reboiler V(1a) is an intermediate reboiler and the at least one reboiler V(1b) is a bottom reboiler;
- 15
- wherein (b) comprises preparing at least three streams from the vapor phase V, comprising the vapor stream G having a pressure p_G and a temperature T_G with $0.95 \leq p_G/p_V \leq 1.00$, and further comprising two streams T(1a) and T(1b), said stream T(1a) having a pressure $p_{T(1a)}$ and a temperature $T_{T(1a)}$ with $p_{T(1a)} > p_V$ and $T_{T(1a)} > T_V$ and said stream T(1b) having a pressure $p_{T(1b)}$ and a temperature $T_{T(1b)}$ with $p_{T(1b)} > p_V$ and $T_{T(1b)} > T_V$;
- 20
- wherein (d) comprises
- (d.1) passing at least a part of the stream T(1a) as a heating medium through a reboiler V(1a) of the rectification column D, obtaining a stream T_C(1a) having a temperature $T_{T_C(1a)}$ with $T_{T_C(1a)} < T_{T(1a)}$;
- 25
- (d.2) passing at least a part of the stream T(1b) as a heating medium through a reboiler V(1b) of the distillation column D, obtaining a stream T_C(1b) having a temperature $T_{T_C(1b)}$ with $T_{T_C(1b)} < T_{T(1b)}$; and
- 30
- wherein (e) comprises
- (e.1) feeding at least a part of the stream T_C(1a) into the rectification column D;
- (e.2) feeding at least a part of the stream T_C(1b) into the rectification column D.
14. A chemical production unit for carrying out the process according to any one of claims 1 to 13, comprising
- 35
- a rectification column D comprising
- in its lower part, inlet means for feeding streams W(i) or one or more combined stream thereof into D;

- in its upper part, outlet means for removing a vapor stream V or divided streams thereof, comprising at least a gaseous stream G and at a stream T(1a), from the top of D;
 - at least one reboiler V(1a);
 - 5 - optionally a stream dividing device S_o for dividing V or substreams of V into (further) sub streams thereof;
 - a first compressor C_T(1) for compressing T(1a) or a part thereof;
 - means for passing compressed sub streams of T(1) from C_T(1) as heating medium through intermediate reboiler V(1a);
 - 10 - a stream dividing device S for dividing the stream G into n streams G(i);
 - means for passing the stream G to said stream dividing device S;
 - n reactive distillation columns K(i), n≥2 and i=1...n; said reactive distillation columns K(i) being arranged in parallel, each reactive distillation column K(i) comprising
 - in its upper part, preferably in its top, inlet means for feeding a stream H(i) into
 - 15 K(i);
 - in its lower part, inlet means for feeding a stream G(i) into K(i);
 - outlet means for removing a stream W(i) from the top of K(i);
 - a bottom reboiler;
 - outlet means for removing a bottoms stream from K(i);
 - 20 -- a stream dividing means for separating a stream P(i) from the bottoms stream removed from K(i);
 - means for passing the streams G(i) to the reactive distillation columns K(i);
 - spatially separated means for passing at least one of the streams W(i) and at least
 - 25 another one of the streams W(i) at different positions to the rectification column D;
 - one or more compressors C(i) for compressing either the stream G and/or the streams G(i) and/or the streams W(i).
- 30 15. Use of a chemical production unit according to claim 14 or of a process according to any one of claims 1 to 13 for simultaneously producing n mixtures P(i) comprising alkali metal methoxide and methanol, n being an integer with n≥2 and i=1...n, wherein either at least 2 of the mixtures P(i) comprise different alkali metal methoxides A(i)OMe, and/or at least 2 of the mixtures P(i) comprise the same alkali metal alkoxide A(i)OMe at
- 35 different concentrations.