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Datasheet for the decision of 18 December 2025

Case Number: T 0074/24 - 3.3.02

Application Number: 10740170.5

Publication Number: 2459555

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Language of the proceedings: EN

Title of invention:
PROCESSES FOR CRYSTALLIZATION OF RIVAROXABAN

Patent Proprietor:
KRKA, D.D., Novo Mesto

Opponent:
Dr. Schön, Neymeyr & Partner Patentanwälte mbB

Relevant legal provisions:
EPC Art. 123(2), 56

Keyword:
Amendments
Inventive step

Decisions cited:
T 0304/08, T 0268/13, T 2111/13, T 0875/14

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Case Number: T 0074/24 - 3.3.02

D E C I S I O N
of Technical Board of Appeal 3.3.02
of 18 December 2025

Appellant: (Opponent)	Dr. Schön, Neymeyr & Partner Patentanwälte mbB Bavariaring 26 80336 München (DE)
Respondent: (Patent Proprietor)	KRKA, D.D., Novo Mesto Smarjeska cesta 6 8501 Novo mesto (SI)
Representative:	Hoefer & Partner Patentanwälte mbB Pilgersheimer Straße 20 81543 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 17 November 2023 rejecting the opposition filed against European patent No. 2459555 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	M. O. Müller
Members:	A. Lenzen
	B. Burm-Herregodts

Summary of Facts and Submissions

I. The opponent (appellant) lodged an appeal against the opposition division's decision (decision under appeal) to reject the opposition against European patent No. 2 459 555 (patent).

II. Reference is made in the present decision to the following documents filed with the opposition division:

D2 WO 01/47919 A1
D3 US 2005/0182055 A1
D4 WO 2007/039132 A1
D5 Vogel's Textbook of Practical Organic Chemistry, fifth edition, pages 135 to 153
D6 Experimental report (13 pages), filed by the appellant with the notice of opposition
D7 Experimental report (10 pages), filed by the appellant with its letter dated 24 August 2023
D9 Experimental report (9 pages), filed by the appellant with its letter dated 24 August 2023
D11 WO 2014/020458 A1

III. With the reply to the statement of grounds of appeal, the patent proprietor (respondent) filed, *inter alia*, the set of claims of auxiliary request 2.

IV. In preparation for the oral proceedings, which had been arranged at the parties' request, the board issued a communication under Article 15(1) RPBA. In it, the board summarised the parties' submissions from the statement of grounds of appeal and the reply, and expressed its preliminary opinion on selected issues.

V. The parties filed further substantive submissions by letters dated 30 October 2025 (respondent) and 18 November 2025 (appellant).

VI. Oral proceedings before the board were held by videoconference on 18 December 2025 in the presence of both parties. The respondent made auxiliary request 2 (filed with the reply to the statement of grounds of appeal) its first auxiliary request. At the end of the oral proceedings, the chair announced the order of the present decision.

VII. The parties' final requests at the end of the oral proceedings, in so far as they are relevant to this decision, were as follows.

- The appellant requested that the decision under appeal be set aside and that the patent be revoked in its entirety.
- The respondent requested that the appeal be dismissed, implying that the decision under appeal rejecting the opposition be confirmed (main request), or, in the alternative, that the patent be maintained in amended form based on the set of claims of the first auxiliary request, filed as auxiliary request 2 with the reply to the statement of grounds of appeal.

VIII. Summaries of the parties' submissions relevant to the present decision and key aspects of the decision under appeal are set out in the reasons for the decision below.

Reasons for the Decision

Main request (patent as granted) – Inventive step (Article 56 EPC)

1. Claim 1 reads as follows:

"*Process for preparing rivaroxaban or a pharmaceutically acceptable salt or solvate thereof comprising the following steps:*

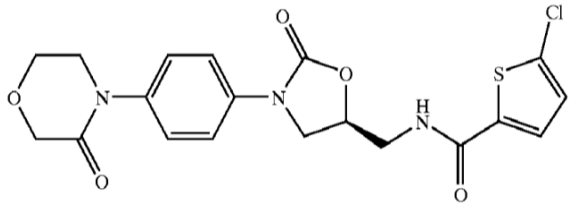
a) dissolving rivaroxaban in a solvent or a mixture of solvents
b) crystallization of rivaroxaban
c) washing and drying the crystals and
d) obtaining pure rivaroxaban

wherein pure rivaroxaban has a purity at least 99,0 area % as determined by HPLC,
wherein the crystallization according to b) is achieved either by

(i) decreasing the temperature of a rivaroxaban crystallization mixture comprising rivaroxaban and a solvent from a temperature between room temperature and the reflux temperature of the solvent to a temperature within the range -20 °C to 40 °C,
(ii) the addition of an anti-solvent to a solution of rivaroxaban in a solvent, or
(iii) the addition of a solution of rivaroxaban in a solvent to an anti-solvent,

the solvent from step (i) being selected from 2-butanone, 3-pentanone, acetonitrile, 1-butanol and mixtures thereof, and
the solvent from steps (ii) and (iii) being selected from DMSO, DMF, DMA, acetic acid or mixtures thereof."

2. Rivaroxaban, as referred to in claim 1, is an anticoagulant. It has the following chemical structure:



3. Claim 1 of the main request thus essentially relates to a crystallisation process for rivaroxaban or one of its salts or solvates. This process is carried out in accordance with one of three alternatives (i) to (iii). Under alternative (i), crystallisation is brought about by decreasing the temperature. Under alternatives (ii) and (iii), crystallisation is achieved by using an anti-solvent; either a solution of rivaroxaban in a solvent is admixed with an anti-solvent (alternative (ii)), or the solution is added to an anti-solvent (alternative (iii)).

4. Interpretation of claim 1

4.1 As is apparent from step d) and the subsequent indication of the degree of purity, the process of claim 1 is intended to provide rivaroxaban of very high purity. Claim 1 can therefore be interpreted as relating to a process for preparing rivaroxaban or a pharmaceutically acceptable salt or solvate thereof

having a purity of at least 99.0 area % as determined by HPLC.

4.2 With reference to decisions T 304/08 and T 875/14, the appellant took the view that the purpose as construed above (i.e. for preparing rivaroxaban or a pharmaceutically acceptable salt or solvate thereof having a purity of at least 99.0 area % as determined by HPLC) constituted a desideratum and could not have any limiting effect on the subject-matter of claim 1.

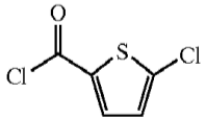
The board does not agree. In each of the two decisions cited by the appellant, the claim at issue related to a process reciting steps directed to preparing a product, with the claimed purpose of the process referring to an effect inherent to the product (T 304/08: "*for reducing malodor associated with a disposable absorbent product intended for the absorption of body fluids*"; T 875/14: "*for reducing the inhalation toxicity of the functional fluids*"). The purity of rivaroxaban, however, is not an effect inherent to rivaroxaban but rather a structural characteristic of the substance. The claimed purity therefore does indeed limit the subject-matter of claim 1 (similarly, see also T 268/13, point 2.8 of the Reasons; T 2111/13, point 3.4 of the Reasons).

5. Closest prior art

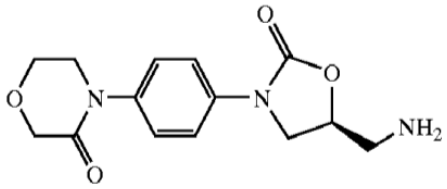
5.1 The appellant argued that the subject-matter of alternative (i) of claim 1 did not involve an inventive step over D3 as the closest prior art.

5.2 D3 (paragraphs [0043] to [0049]) discloses a three-step synthesis for rivaroxaban.

- The first step provides the following acid chloride as an approximately 30% strength solution in toluene:



- In the second step, this acid chloride is reacted with the hydrochloride of the following amine in a water/acetone/toluene mixture at elevated temperature and in the presence of sodium carbonate:



After cooling to 26 °C, the precipitated rivaroxaban is filtered off and washed with water and acetone. This gives a crude rivaroxaban.

- Lastly, in the third step, the crude rivaroxaban obtained in the second step is recrystallised from acetic acid. Specifically, a "*solvent-containing crude product (residual moisture content 9.4%)*" is dissolved in hot acetic acid. The resulting solution is filtered and subsequently cooled to 20 °C. The precipitated product is filtered, washed with acetic acid and water, and finally dried.

This synthesis produces rivaroxaban in an overall yield of 94.7% and with a melting point of 230 °C.

The third and final step of the synthesis of D3 will be referred to below as the recrystallisation step.

5.3 As set out above, claim 1 relates to a crystallisation process which aims to provide rivaroxaban of very high purity.

It is true, as pointed out by the respondent, that D3 does not address the specific problems which the inventors set out to solve according to the patent, such as, in particular, separating des-chloro rivaroxaban impurities and implementing rivaroxaban synthesis on an industrial scale. Nevertheless, D3, in a similar manner to the patent, likewise clearly pursues the objective of increasing the purity of rivaroxaban by means of its recrystallisation step. The board therefore concurs with the appellant that D3 is in fact suitable as the closest prior art.

5.4 As also set out above, in the synthesis of D3, the crude rivaroxaban resulting from the second step, i.e. the "*solvent-containing crude product (residual moisture content 9.4%)*", is recrystallised from acetic acid in the third and final step.

The respondent took the view that this crude rivaroxaban product contained, in addition to water, at least toluene and acetone as solvent impurities, as well as further unknown by-products from the preceding synthesis steps. However, the content of toluene, acetone and such by-products was not disclosed in D3. Consequently, the composition of the solution from which rivaroxaban was recrystallised in D3 was unknown, and the recrystallisation ultimately was not disclosed in an enabling manner.

However, in a multi-step synthesis, it is not unusual to use, in a subsequent synthesis step, intermediates which have not been completely purified. Considering

such a synthesis step to be not enabling merely because the exact composition of the intermediate used in it is not disclosed is not convincing. That is because the exact composition of the intermediate is a direct consequence of the process steps previously carried out, so knowledge of the exact composition is not required for carrying out the subsequent steps.

As the board was not convinced by the respondent's submission that the recrystallisation disclosed in D3 was not enabling, there was no need at the oral proceedings to decide on the appellant's request that this submission not be admitted.

6. Distinguishing features

6.1 The parties agreed that the subject-matter of alternative (i) of claim 1 differs from the recrystallisation step of D3 in that a different solvent is used in step a) of claim 1. Specifically, claim 1 requires a solvent "*selected from 2-butanone, 3-pentanone, acetonitrile, 1-butanol and mixtures thereof*", whereas D3 uses acetic acid as the solvent.

6.2 The only other possible distinguishing feature over D3 considered by the parties was the purity of rivaroxaban specified in claim 1. As explained above, this purity limits the subject-matter of claim 1 and thus indeed constitutes a potential distinguishing feature over D3.

It was undisputed among the parties that D3 does not expressly disclose the purity of rivaroxaban obtained after the recrystallisation step. However, D7, an experimental report submitted by the appellant and admitted by the opposition division, essentially describes a smaller-scale repetition of the rivaroxaban

synthesis disclosed in D3. It shows that rivaroxaban is obtained with a purity of 99.89% as determined by HPLC after the recrystallisation step (D7, page 7, penultimate line), i.e. a purity as required by claim 1 of the main request.

In this context, the respondent's argument that D7 failed to indicate the solvents used for determining purity is entirely irrelevant. Claim 1 of the main request, like D7 itself, does not specify the conditions – including the solvents – to be used for determining purity by means of HPLC. Consequently, the HPLC determination carried out in D7 complies with claim 1 of the main request, irrespective of which solvents were in fact used in D7. Likewise, the respondent's argument that no explanation was provided for one peak in the relevant HPLC chromatogram of D7 is irrelevant, since knowledge of which compound corresponds to which peak is not required in order to determine the purity of a compound by HPLC.

Thus, on the basis of D7, and without any counter-evidence from the respondent, the board agrees with the appellant that D3 implicitly discloses rivaroxaban having a purity in accordance with claim 1 of the main request. The purity thus does not constitute a distinguishing feature.

6.3 The respondent submitted further arguments on the substantive assessment of D3 and D7, as well as arguments against the opposition division's decision to admit D7. These are addressed in turn below.

6.4 The merits of D7 compared with D3

6.4.1 The respondent argued that the synthesis described in D7 differed from that disclosed in D3 on account of both the overall yield and the way in which the rivaroxaban crystals obtained after recrystallisation were washed, as follows.

(a) The overall yield achieved in D7 (85%) was lower than that reported in D3 (94.7%).
(b) In D7, the rivaroxaban crystals were washed once with acetic acid and four times with water. By contrast, D3 disclosed that the rivaroxaban crystals were "*washed with acetic acid and water*". The skilled person would have understood this as one single washing step applying acetic acid and water.

In the respondent's view, with which the opposition division agreed, these differences showed that D7 did not constitute a faithful repetition of the rivaroxaban synthesis disclosed in D3 and therefore should be disregarded.

6.4.2 However, the board is not convinced by these arguments for the following reasons.

Regarding (a):

It is not appropriate to disregard a repetition of a synthesis solely on the ground that the overall yield achieved in that repetition does not fully reach the overall yield disclosed in the prior art. As pointed out by the appellant, and in the absence of any evidence to the contrary from the respondent, it is not apparent why the purity of rivaroxaban achieved in D7 should be different from that of D3 merely because the yield obtained is somewhat lower.

In particular, D7 constitutes a repetition of D3 on a smaller scale, meaning that the amounts and volumes were each reduced by the same factor compared with D3. Consequently, with respect to the amount of crude rivaroxaban, D7 uses the same relative amount of acetic acid for recrystallisation as disclosed in D3. Contrary to the respondent's argument, therefore, it cannot be accepted that the recrystallisation in D7 was deliberately carried out using a larger relative amount of solvent in order to achieve a higher purity at the expense of a lower yield.

Regarding (b):

The respondent's argument that the skilled person would interpret the general washing instruction disclosed in D3 ("*washed with acetic acid and water*") as a single washing step using acetic acid and water is merely an assertion and is therefore unconvincing. The board considers the implementation of the general washing instruction of D3, as adopted in D7, to be reasonable. As was common ground among the parties, the purpose of washing crystals after recrystallisation is to remove adhering mother liquor, a purpose that is achieved in both D3 and D7. Accordingly, in agreement with the appellant and contrary to the respondent's suggestion, the board sees no reason to assume that the additional washings with water performed in D7 result in a higher purity of rivaroxaban compared with D3, at least in the absence of any evidence to the contrary from the respondent.

6.4.3 The respondent further argued that the crude rivaroxaban from the second step in the synthesis described in D7 was dried for the purpose of

determining its yield and purity. This constituted a further difference over D3, which did not disclose any such drying step.

However, the board sees no reason on this basis to doubt that D7 is a faithful reproduction since (i) the dried crude product is subsequently reconstituted prior to recrystallisation with the required amount of water to obtain the same "*solvent-containing crude product (residual moisture content 9.4%)*" as disclosed in D3, and (ii) there is no apparent reason why merely removing solvent by drying would result in an improvement of the purity profile of the crude rivaroxaban. This was even conceded by the respondent in the context of D4 (see page 91, first paragraph of the respondent's reply to the statement of grounds of appeal).

6.5 The merits of D7 compared with D6 and D9

6.5.1 The respondent compared the batches of crude rivaroxaban described by the appellant in D6 (page 3, paragraphs 1 to 3), D7 (page 3, last three paragraphs) and D9 (page 1, third and second-to-last paragraphs; figure 1).

6.5.2 The contents of D6 and D7 have already been summarised above.

D9 describes a repetition of the crystallisation disclosed in example 2.3 of D4, which was cited by the appellant as the closest prior art for alternatives (ii) and (iii) of claim 1 of the first auxiliary request (see further below). For this repetition, D9 uses crude rivaroxaban obtained in accordance with D3.

6.5.3 Specifically, the respondent argued that although each of the batches of crude rivaroxaban described in D6, D7 and D9 was allegedly prepared in accordance with the first and second synthesis steps of D3, the corresponding HPLC chromatograms, yields and purities were different. This also demonstrated that, *inter alia*, the reproduction in D7 could not constitute a faithful repetition of D3.

6.5.4 However, as already set out above, and as also emphasised by the respondent itself, the reproduction of D6 differs from that of D7 in that, in the second synthesis step leading to crude rivaroxaban, a significantly larger amount of acid chloride is used than in D3. If the syntheses described in D6 and D7 thus differ from one another to this extent, any differences observed between them with respect to the HPLC chromatogram, yield or purity are unsurprising and, at least in the absence of any evidence to the contrary from the respondent, cannot establish that the reproduction of D7 is not faithful. Furthermore, in the board's view, the differences between the crude rivaroxaban batches described in D7 and D9 are insignificant and do not call the reproduction in D7 into question either.

6.6 The merits of D3 in view of D2/D11

6.6.1 Lastly, the respondent argued that D3 reported a melting point of 230 °C for rivaroxaban. By contrast, D11 (page 3, penultimate paragraph) referred to D2 as disclosing that rivaroxaban with a chemical purity of 100% had a higher melting point of 232 to 233 °C. The lower melting point reported for rivaroxaban in D3 was indicative of the presence of impurities. D11 even

stated that its authors had found that rivaroxaban obtained by the process disclosed in D3 contained high levels of specific impurities, meaning that this process was not suitable for preparing rivaroxaban on an industrial scale. On this basis, the rivaroxaban prepared according to D3 could not be expected to have the claimed purity.

6.6.2 However, although D2 (page 83, line 3) discloses a melting point of 232 to 233 °C for rivaroxaban, it does not in fact state, as asserted in D11, that its rivaroxaban has a chemical purity of 100%. Furthermore, as the appellant pointed out, D11 does not provide any experimental data to support its assertion that D3 produces only impure rivaroxaban. Ultimately, therefore, the mere statement in patent document D11 that the process described in D3 leads to lower-purity rivaroxaban is to be weighed against the appellant's experimental repetition in D7 which, as set out above, demonstrates that the rivaroxaban obtained according to D3 has the claimed purity. The board considers the experimental evidence (D7) to be of greater probative value than a mere statement in a patent document (D11).

6.7 Admittance (or reversal of the admittance) of D7

6.7.1 With regard to the opposition division's decision to admit D7 and the respondent's request that this decision be overturned, the history of the case is relevant. It is summarised below.

With the notice of opposition, the appellant had filed D6 which, like D7, describes a repetition of the rivaroxaban synthesis disclosed in D3. However, unlike D7 and by comparison with D3, D6 does not maintain the same ratio of reactants in step 2, instead using a

higher proportion of the acid chloride. In the annex to the summons, the opposition division highlighted, *inter alia*, this discrepancy between D6 and D3 as a point requiring discussion during the oral proceedings. Subsequently, the appellant filed D7, which rectified this discrepancy between D6 and D3. The opposition division admitted D7 into the proceedings because it considered its filing to be a response to the opposition division's remarks in the annex to the summons.

6.7.2 The respondent merely argued that D7 was not filed until about one month before the oral proceedings, thereby depriving the respondent of the opportunity to review, analyse or repeat the experiments of D7, and that the opposition division had failed to set out the *prima facie* relevance of D7.

The board does not see any flaw in the opposition division's exercise of discretion. In particular, and as indicated in the decision under appeal, the filing of D7 was prompted by developments before the opposition division, namely the remarks on D6 expressed in the annex to the summons. The admittance of D7 was justified for this reason alone. Therefore, D7 cannot be considered late-filed, and the question of whether the opposition division considered the *prima facie* relevance of D7 for its admittance is irrelevant.

On this basis, the board decided at the oral proceedings, contrary to the respondent's request, not to set aside the opposition division's decision on the admittance of D7, meaning that D7 remained in the proceedings.

The board notes that not having had enough time to react would have been grounds for requesting postponement of the oral proceedings before the opposition division; however, the respondent did not make any such request.

6.8 In summary, the respondent's counter-arguments do not change the above conclusion that the purity of rivaroxaban in D3 is as claimed.

Consequently, the only feature that distinguishes the subject-matter of claim 1 of the main request from D3 is the solvent used for recrystallisation (see point 6.1 above).

7. Technical effects and objective technical problem

7.1 With regard to technical effects linked to the distinguishing feature identified above, the respondent pointed to examples 22, 28, 30 and 31 of the patent.

In these examples, the same amount of rivaroxaban is recrystallised from different solvents. More specifically, example 22 uses acetic acid, and examples 28, 30 and 31 use acetonitrile, 2-butanone and 1-butanol, respectively.

7.2 The respondent essentially argued that example 22, which used acetic acid as the solvent, represented the teaching of the closest prior art D3 and that examples 28, 30 and 31, which used solvents as provided for in claim 1 of the main request, were in accordance with the invention. Examples 28, 30 and 31 showed that the solvents according to the invention achieved a higher yield of recrystallised rivaroxaban and a reduction in des-chloro impurities. Furthermore, 2-butanone

(example 30) showed an improvement in overall purity compared with acetic acid (example 22).

7.3 However, the board shares the appellant's view that the comparison made by the respondent does not allow any conclusion to be drawn regarding a technical effect. On the one hand, different volumes of solvent are used in examples 22, 28, 30 and 31, i.e. volumes that determine the yield after recrystallisation. On the other hand, the examples of the patent do not contain any information regarding the purity of the rivaroxaban to be recrystallised. Consequently, the higher purity in examples 28, 30 and 31 may also be due to an amount of solvent or a purity of the starting material different from that in example 22. Any assessment of the success of the recrystallisation with respect to potential increases in purity therefore cannot be attributed to the type of solvent, which is the distinguishing feature over D3.

7.4 In addition to yield and purity, the respondent, relying on statements in the application as filed, also invoked further technical effects, in particular that the claimed process was simple, economical and suitable for application on an industrial scale. The reason for this, in the respondent's view, was that the solvent used in D3 (acetic acid) was well known to be corrosive.

However, the statements relating to these effects in the application as filed amount to mere assertions. As correctly pointed out by the appellant, the respondent, other than comparing example 22 with examples 28, 30 and 31 of the patent, did not refer to any further comparison demonstrating that the distinguishing feature over D3 is in fact associated with these

effects. Consequently, given that the statements are mere assertions, they cannot be taken into account.

7.5 It follows that the distinguishing feature identified above is not associated with any technical effect. Therefore, the objective technical problem is that put forward by the appellant, namely to provide an alternative process for crystallising rivaroxaban.

8. Obviousness

8.1 As stated by the appellant, not only acetic acid, which is used for recrystallisation in D3, but also, for example, acetonitrile and 2-butanone mentioned in claim 1 of the main request are solvents commonly used for recrystallisation (D5, paragraph spanning pages 136 and 137; table 2.8). In seeking a solution to the above objective technical problem, and when faced with the list of common solvents described in D5, the skilled person would have required only routine experimentation to determine that, for example, acetonitrile and 2-butanone are suitable for recrystallising rivaroxaban. In view of this, the alleged limitations of the teaching of D5 emphasised by the respondent – namely that D5 concerns recrystallisation in general and not specifically that of rivaroxaban, and that a suitable solvent may need to be identified experimentally according to D5 – do not negate this conclusion.

For the sake of completeness, it is added that even if the technical effects attributed by the respondent to the use of different solvents in claim 1 of the main request, as compared with the corrosive solvent acetic acid used in D3, were taken into account in formulating the objective technical problem, the solution would still have been obvious to the skilled person since

they would have had good reason to replace acetic acid with a different, non-corrosive solvent. This would have prompted the skilled person all the more to try the non-corrosive solvents disclosed in D5, such as acetonitrile and 2-butanone.

It follows that the subject-matter of alternative (i) of claim 1 of the main request does not involve an inventive step and the main request is not allowable.

First auxiliary request – Amendments (Article 123(2) EPC)

9. Claim 1 of the first auxiliary request differs from claim 1 of the main request only in that alternative (i) has been deleted.

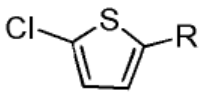
Claim 10 of the first auxiliary request is dependent on claim 1 and reads as follows:

"*The process according to any of the preceding claims characterized in that the rivaroxaban is synthesized by a method of synthesizing a rivaroxaban that comprises an amount of des-chloro rivaroxaban selected from not greater than about*

A) 0,2 %,
B) not greater than about 0,15 %, or
C) not greater than about 0,10 %

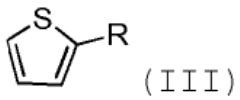
which method comprises:

a) obtaining one or more samples of one or more compound of formula (II) batches;



(II)

b) measuring the level of compound of formula (III)



(III)

in each of the samples of (a);

c) selecting a compound of formula (II) batch that comprises a purity of compound of formula (II) based on the measurement of compound of formula (III) conducted in (b); and

d) using the batch selected in (c) to synthesize rivaroxaban,

wherein R of formulas (II) and (III) are defined with R being - COOH, COX, wherein X is halogen selected from Cl, F, Br, J, or compounds (II) and (III) are anhydrides."

Thus, claim 10 refers back to claim 1 and essentially defines the manner in which the rivaroxaban to be purified by crystallisation is to be synthesised.

10. According to the appellant, the subject-matter of claim 10 of the first auxiliary request extended beyond the content of the application as filed.

Specifically, the application as filed disclosed a process for purifying rivaroxaban in claims 1 to 12 and a process for synthesising rivaroxaban in claim 13. However, claim 13 as filed was independent and did not refer back to one of claims 1 to 12. Therefore, contrary to claim 10 of the first auxiliary request,

the application as filed did not disclose that the rivaroxaban obtained by the synthesis process (claim 13 as filed) was to be used in the purification process (claims 1 to 12 as filed). In particular, purification examples 1 to 31 did not disclose how rivaroxaban was synthesised. In synthesis example 32, rivaroxaban was purified by a different process from that of claim 1 of the first auxiliary request. On top of that, the word "optional" had been deleted in claim 1 of the first auxiliary request, rendering step c) mandatory.

11. The board agrees with the respondent and the decision under appeal that this is not convincing for the following reasons.

The introductory part of the application as filed (page 4, lines 9 to 35) emphasises that rivaroxaban obtained by known synthetic processes contains impurities. It states that "*[i]n particular, the present inventors have determined the des-chloro impurity of rivaroxaban*" (page 4, lines 32 et seq.), emphasising that this impurity can be reduced by the purification processes disclosed in the application as filed. The synthesis process of the application as filed is also recognisably aimed at avoiding this des-chloro impurity. The skilled person would therefore deduce from the application as filed that the rivaroxaban used in the purification process preferably originates from the synthesis process. Furthermore, the deletion of the word "*optionally*" does not result in added subject-matter either.

The reasoning above had already been set out in the board's communication under Article 15(1) RPBA and was not contested by the appellant at the oral proceedings.

First auxiliary request – Inventive step (Article 56 EPC)

12. Closest prior art

12.1 Since alternative (i) of claim 1 has been deleted, the appellant's inventive-step objection against this alternative starting from D3 has been rendered moot; the appellant did not contest this. The appellant argued, however, that the subject-matter of alternatives (ii) and (iii), which still remain in claim 1 of the first auxiliary request, did not involve an inventive step over D4 as the closest prior art.

12.2 The question of whether D4 is suitable as the closest prior art in the case in hand, which was contested by the respondent, may be left open since in any event an inventive step can be acknowledged starting from this document (see below).

12.3 In example 2.3 of D4 (page 10), approximately 200 mg of rivaroxaban are dissolved in approximately 40 ml of hot 1-pentanol. The solution is filtered and divided into two portions. One portion is treated with *n*-heptane until rivaroxaban precipitates. The residue is filtered off and dried at room temperature. It is found to be modification II of rivaroxaban.

D4 (page 6, lines 21 to 25) also discloses a corresponding, albeit more general, process that does not identify any specific solvents. As already set out by the board in its communication under Article 15(1) RPBA – and not contested by the appellant at the oral proceedings – this more general process is not a more suitable starting point for assessing inventive step. The following analysis therefore concentrates on example 2.3 of D4.

13. Distinguishing features

13.1 The parties agreed that the subject-matter of alternatives (ii) and (iii) of claim 1 of the first auxiliary request differs from D4 in that a different solvent is used in step a). Specifically, claim 1 requires a solvent "*selected from DMSO, DMF, DMA, acetic acid or mixtures thereof*", whereas D4 uses 1-pentanol as the solvent.

13.2 A further possible distinguishing feature over D4 considered by the parties was the purity of rivaroxaban specified in claim 1 of the first auxiliary request. As set out above, this purity limits the subject-matter of claim 1 and thus indeed constitutes a potential distinguishing feature over D4.

13.2.1 It was undisputed among the parties that D4 does not expressly disclose the purity of rivaroxaban obtained in example 2.3.

13.2.2 At the oral proceedings, the appellant submitted for the first time in the appeal proceedings that it could be concluded from the DSC and TGA chromatograms of D4 that the rivaroxaban obtained according to example 2.3 of D4 had to have a purity in accordance with claim 1 of the first auxiliary request. Contrary to the respondent's request, the board admitted this submission into the proceedings. However, at least without further substantiation, this submission is a mere assertion which is not convincing.

13.2.3 Furthermore, in the appellant's view, its experimental report D9, which was admitted by the opposition

division, demonstrated that a repetition of example 2.3 of D4 yielded rivaroxaban with the claimed purity.

At the oral proceedings, the board decided, contrary to the respondent's request, not to set aside the opposition division's decision on the admittance of D9.

13.2.4 In D9, example 2.3 of D4 is repeated in two different ways. A hot solution of crude rivaroxaban in 1-pentanol is filtered and cooled to either 40 °C or -10 °C, followed by the addition of *n*-heptane at the same temperature and subsequent further cooling. D9 reports HPLC purities of 99.66 area % and 99.61 area %, respectively.

13.2.5 However, whereas D4 states that modification II of rivaroxaban is obtained, D9 yields modification I in both cases. Accordingly, D9 results in an entirely different solid-state form of rivaroxaban from that disclosed in D4. Without further investigation, it cannot simply be assumed that the high purity achieved by the crystallisation of one modification would also be achieved for another modification. The board therefore agrees with the respondent that D9 cannot be a faithful repetition of D4 and that, as a consequence, D9 cannot show that the rivaroxaban obtained in example 2.3 of D4 has a purity meeting the requirement of claim 1 of the main request.

13.2.6 It follows that the purity of claim 1 of the first auxiliary request is a distinguishing feature over D4.

13.3 As an inventive step can already be acknowledged in view of the two distinguishing features above (nature of solvent and purity), there is no need to assess whether further features of claim 1 of the first

auxiliary request are also distinguishing over D4, such as the washing step and the order of addition in alternative (iii).

14. Technical effect and objective technical problem

Since the purity specified in claim 1 constitutes a distinguishing feature over D4 (the purity achieved in D4 being lower), the directly resulting technical effect is increased purity. This increased purity can only be attributed to the use of a different solvent in step a), i.e. the first distinguishing feature.

In agreement with the respondent, the objective technical problem is therefore to provide an improved crystallisation process for rivaroxaban, the improvement residing in an increased purity of rivaroxaban.

15. Obviousness

15.1 In the case in hand, it is not apparent why the skilled person would have assumed, with a reasonable expectation of success, that using the solvents specified in claim 1 for alternatives (ii) and (iii) would have resulted in an increase in the purity of rivaroxaban.

At the oral proceedings, the appellant submitted for the first time in the appeal proceedings that the skilled person using the process of alternatives (ii) or (iii) of claim 1 of the first auxiliary request would in any case have achieved a purity in accordance with claim 1 by repeatedly recrystallising a crude rivaroxaban that was already of high purity. Hence, the problem of achieving a higher purity was solved by

selecting a starting material with high enough purity. Selecting a solvent as claimed therefore merely solved the problem of providing an alternative crystallisation process for rivaroxaban. Contrary to the respondent's request, the board admitted this submission into the proceedings at the oral proceedings. However, the appellant did not provide any evidence that repeated recrystallisation starting from a high purity would have increased that purity to such an extent as to give the resulting product a purity as claimed. In view of this lack of substantiation, the appellant's assertion is not convincing.

15.2 Moreover, even if the objective technical problem were to be formulated as providing a mere alternative crystallisation process for rivaroxaban, it would still not have been obvious for the skilled person to arrive at the claimed subject-matter in view of the documents on which the appellant relied for its objection against the subject-matter of claim 1 of the first auxiliary request (D4, D2 and D5), as set out below.

D4 (page 7, second paragraph) proposes possible alternatives to the solvent used in example 2.3 (1-pentanol), namely essentially other lower alcohols, ketones, alkanes, THF, acetonitrile, toluene, ethyl acetate, 1,4-dioxane and mixtures thereof. As set out by the respondent, these solvents are different from those specified in claim 1 of the first auxiliary request.

Although D5 (paragraph spanning pages 136 and 137; and table 2.8) discloses some of the solvents specified in claim 1 of the first auxiliary request (DMSO, DMF, acetic acid), it does so only in the context of a simple recrystallisation without the use of an anti-

solvent. The board agrees with the respondent that the skilled person would not – at least not without further consideration – have regarded the teaching of D5 as relevant to the process conditions disclosed in example 2.3 of D4. The same applies to D2 (page 83, line 4), which merely discloses the suitability of deuterated DMSO as a solvent for rivaroxaban.

Contrary to the appellant's argument, the skilled person would therefore not have even considered, on the basis of D4, D5 and D2 alone, using the solvents specified in claim 1 for alternatives (ii) and (iii) in the process disclosed in example 2.3 of D4.

16. It follows that the subject-matter of claim 1 of the first auxiliary request involves an inventive step.

17. As the opponent had no objections other than those assessed above under Article 123(2) EPC and Article 56 EPC, it is to be concluded that the first auxiliary request is allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent with the following claims and a description possibly to be adapted thereto:

   Claims 1 to 10 of the first auxiliary request, filed as auxiliary request 2 with the reply to the statement of grounds of appeal

The Registrar: The Chairman:

U. Bultmann M. O. Müller

Decision electronically authenticated