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Datasheet for the decision of 1 December 2015

Case Number: T 0205/13 - 3.3.05

Application Number: 04749491.9

Publication Number: 1613784

IPC: C22B3/00

Language of the proceedings: EN

Title of invention:
COMPOSITION AND PROCESS FOR THE SOLVENT EXTRACTION OF METALS USING ALDOXIME OR KETOXIME EXTRACTANTS

Patent Proprietor:
CYTEC TECHNOLOGY CORP.

Opponent:
IP2 - INTELLECTUAL PROPERTY PARTNERS GBR

Headword:
Copper extractant/CYTEC

Relevant legal provisions:
EPC Art. 54(1), 54(2), 56, 123(2)

Keyword:
Novelty - main request (yes)
Inventive step - main request (no) - no improvement - obvious alternative
Amendments - first to sixth auxiliary requests - added subject-matter (no)
Inventive step - first to sixth auxiliary requests (no) - obvious alternative

Decisions cited:
T 1170/02

Catchword:

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Case Number: T 0205/13 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 1 December 2015

Appellant: (Patent Proprietor)	CYTEC TECHNOLOGY CORP. 300 Delaware Avenue, Suite 903 Wilmington, Delaware 19801 (US)
Representative:	Deckers, Hellmuth Alexander European Patent Attorney Breitbachstrasse 15 55218 Ingelheim am Rhein (DE)
Respondent: (Opponent)	IP2 - INTELLECTUAL PROPERTY PARTNERS GBR Bruchstrasse 13 D-41352 Korschenbroich (DE)
Representative:	Dierkes, Thorsten BASF SE Global Intellectual Property ZRX C006 67056 Ludwigshafen (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 24 October 2012 revoking European patent No. 1613784 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	H. Engl
Members:	J.-M. Schwaller
	O. Loizou

Summary of Facts and Submissions

I. European patent No. 1 613 784 was granted with eleven claims. It concerns a solvent extraction composition comprising orthohydroxyaryl aldoximes and orthohydroxyaryl ketoximes and one or more equilibrium modifiers as defined in claim 1. The patent also contains an independent claim 6 directed to a process for the extraction of a metal from a solution using a solvent extraction composition as defined in claim 1, and a water-immiscible organic solvent.

II. Claim 1 of the patent as granted reads:

"1. A solvent extraction composition comprising one or more orthohydroxyarylaldoximes and one or more orthohydroxyarylketoximes, and one or more equilibrium modifiers selected from 2,2,4-trimethyl-1,3-pentanediol mono-isobutyrate, 2,2,4-trimethyl-1,3-pentanediol mono-benzoate, 2,2,4-trimethyl-1,3-pentanediol diisobutyrate, 2,2,4-trimethyl-1,3-pentanediol di-benzoate, isobutyl heptyl ketone, nonanone, 2,6,8-trimethyl-4-nonanone, diundecyl ketone, 5,8-diethyldodecane-6,7-dione, tridecanol, and nonyl phenol in an amount providing a degree of modification of the orthohydroxyarylaldoximes present of from about 0.2 to 0.61."

III. The following documents cited in the opposition proceedings are relevant for the present decision:

D2: US 6 342 635 B1;

D3: US 6 177 055 B1.

IV. The present appeal lies from the decision of the opposition division to revoke the patent in suit. In the contested decision, the opposition division held that the subject-matter of claim 1 of the main request and the first auxiliary request lacked novelty over the disclosure of document D2.

Further, claim 1 of the second and fourth to sixth auxiliary requests was considered to lack inventive step in the light of document D3 taken in combination with document D2.

Claim 1 of the third auxiliary request was held to extend beyond the content of the application as filed.

V. With the grounds of appeal dated 1 March 2013, the proprietor (the "appellant") submitted two new documents D4 and D5.

D4: G.A. Kordosky et al., *"A State-of-the-Art Discussion of the Solvent Extraction Reagents Used for the Recovery of Copper from Dilute Sulfuric Acid Leach Solutions"*, Separation Science and Technology 22:2-3, pages 215 to 232;

D5: Extract from W.G. Davenport et al., *"Extractive Metallurgy of Copper"*, chapter 18, 4th edition, 2000, Pergamon Press, Elsevier Science, pages 307 to 325.

Also submitted were new sets of claims as auxiliary requests 1 to 6. These new requests correspond, with minor amendments, to auxiliary requests 1 to 6 underlying the contested decision.

The appellant's main request was directed to the claims as granted (see point II above).

VI. The independent product claims of the auxiliary requests read:

Auxiliary request 1:

"1. A solvent extraction composition comprising one or more orthohydroxyarylaldoximes ***selected from 5-(C_8 to C_{14} alkyl)-2-hydroxybenzaldoximes*** *and one or more orthohydroxyarylketoximes* ***selected from 5-(C_8 to C_{14} alkyl)-2-hydroxyacetophenone oximes****, and one or more equilibrium modifiers selected from 2,2,4-trimethyl-1,3-pentanediol mono-isobutyrate, 2,2,4-trimethyl-1,3-pentanediol mono-benzoate, 2,2,4-trimethyl-1,3-pentanediol diisobutyrate, 2,2,4-trimethyl-1,3-pentanediol di-benzoate, isobutyl heptyl ketone, nonanone, 2,6,8-trimethyl-4-nonanone, diundecyl ketone, 5,8-diethyldodecane-6,7-dione, tridecanol, and nonyl phenol in an amount providing a degree of modification of the orthohydroxyarylaldoximes present of from about 0.2 to 0.61."*

Auxiliary request 2:

"1. A solvent extraction composition comprising ***2-hydroxy-5-nonylacetophenone oxime*** *and* ***2-hydroxy-5-nonylsalicylbenzaldoxime****, and 2,2,4-trimethyl-1,3-pentanediol diisobutyrate, in an amount providing a degree of modification of the orthohydroxyarylaldoximess present present of from about 0.2 to 0.61."*

Auxiliary request 3:

"1. A solvent extraction composition comprising one or more orthohydroxyarylaldoximes ***selected from 5-(C_8 to C_{14} alkyl)-2-hydroxybenzaldoximes*** *and one or more orthohydroxyarylketoximes* ***selected from 5-(C_8 to C_{14} alkyl)-2-hydroxyacetophenone oximes,*** *and one or more equilibrium modifiers selected from 2,2,4-trimethyl-1,3-pentanediol mono-isobutyrate, 2,2,4-trimethyl-1,3-pentanediol mono-benzoate, 2,2,4-trimethyl-1,3-pentanediol diisobutyrate, 2,2,4-trimethyl-1,3-pentanediol di-benzoate, isobutyl heptyl ketone, nonanone, 2,6,8-trimethyl-4-nonanone, diundecyl ketone, 5,8-diethyldodecane-6,7-dione, tridecanol, and nonyl phenol in an amount providing a degree of modification of the orthohydroxyarylaldoximes present of from about 0.2 to* ***0.4.****"*

Auxiliary request 4:

"1. A solvent extraction composition comprising ***2-hydroxy-5-nonylacetophenone oxime*** *and* ***2-hydroxy-5-nonylsalicylaldoxime,*** *and 2,2,4-trimethyl-1,3-pentanediol diisobutyrate in an amount providing a degree of modification of the orthohydroxyarylaldoximes present of from about 0.2 to* ***0.4.***"

Auxiliary request 5:

"1. A solvent extraction composition comprising one or more orthohydroxyarylaldoximes ***selected from 5-(C_8 to C_{14} alkyl)-2-hydroxybenzaldoximes*** *and one or more orthohydroxyarylketoximes* ***selected from 5-(C_8 to C_{14} alkyl)-2-hydroxyacetophenone oximes,*** *and one or more equilibrium modifiers selected from 2,2,4-*

trimethyl-1,3-pentanediol mono-isobutyrate, 2,2,4-trimethyl-1,3-pentanediol mono-benzoate, 2,2,4-trimethyl-1,3-pentanediol diisobutyrate, 2,2,4-trimethyl-1,3-pentanediol di-benzoate, isobutyl heptyl ketone, nonanone, 2,6,8-trimethyl-4-nonanone, diundecyl ketone, 5,8-diethyldodecane-6,7-dione, tridecanol, and nonyl phenol in an amount providing a degree of modification of the orthohydroxyarylaldoximes present of from about 0.2 to ***0.3.***"

Auxiliary request 6:

"1. A solvent extraction composition comprising ***2-hydroxy-5-nonylacetophenone oxime*** *and* ***2-hydroxy-5-nonylsalicylbenzaldoxime****, and 2,2,4-trimethyl-1,3-pentanediol diisobutyrate in an amount providing a degree of modification of the orthohydroxyarylaldoximes present of from about 0.2 to* ***0.3.***"

VII. With a letter dated 12 September 2013, the opponent ("the respondent") presented its arguments. It requested that the appeal be dismissed.

VIII. At the oral proceedings which took place on 1 December 2015, the discussion focused on novelty, inventive step and the allowability under Article 123(2) EPC of the subject-matter of claim 1 of the main request and auxiliary requests 1 to 6, in particular in view of documents D2 and D3.

IX. Closing the debate, the chairman ascertained the parties' requests to be as follows:

The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted or, alternatively, that the patent be

maintained in amended form on the basis of one of the sets of claims according to auxiliary requests 1 to 6 filed with letter dated 1 March 2013.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. Main request - Novelty

1.1 D2 discloses in column 7, lines 24 to 28, reagent compositions useful in the extraction of copper comprising at least one ketoxime and at least one aldoxime, optionally with one or more equilibrium modifiers. A particularly preferred composition is a mixture of 25 to 75 mole-% of 2-hydroxy-5-nonyl-acetophenone oxime and 75 to 25 mole-% of 5-dodecyl-salicylaldoxime (D2, column 8, lines 38 to 42). Equilibrium modifier substances may be incorporated in amounts providing a degree of modification of the hydroxylaryl aldoxime constituent of from 0.4 to 1.0, preferably 0.55 to 1.0. Suitable equilibrium modifiers are long-chain aliphatic alcohols such as [...], **tridecanol**; long-chain alkylphenols such as [...], **nonylphenol**; organophosphorus compounds saturated or unsaturated aliphatic or aromatic-aliphatic esters containing from 10 to 30 carbon atoms (D2, column 8, lines 43 to 58). Especially useful are esters derived from certain diacids, preferably branched diacids, for instance **2,2,4-trimethyl-1,3-pentanediol diisobutyrate** (D2, column 8, line 65, to column 9, line 2).

In the examples, the copper was extracted using a mixture of 5-nonyl-2-hydroxyacetophenone oxime and 5-nonylsalicylaldoxime (also known as 2-hydroxy-5-

nonylbenzaldoxime), without any equilibrium modifier.

1.2 For the board, the disclosure of D2 is not novelty-destroying for the claims as granted because, even if the explicit combination of 5-nonyl-2-hydroxy-acetophenone oxime and 2-hydroxy-5-nonylbenzaldoxime is disclosed, a double selection would have to be made to arrive at the subject-matter of claim 1 or 6 as granted:

- the first selection is the specific choice of one of the specific equilibrium modifiers indicated in bold in point 1.1 above from among the modifiers listed in D2;

- the second selection is the choice of a specific value for the degree of modification within the ranges disclosed in D2 - i.e. **0.4** to 1.0, preferably **0.55** to 1.0 - which partially overlap with the range claimed, namely "about 0.2 to 0.61".

The requirements of Article 54 EPC are thus met.

2. Main request - Inventive step

2.1 The patent in suit relates to a solvent extraction composition comprising one or more orthohydroxyaryl-aldoximes, one or more orthohydroxyarylketoximes, and one or more equilibrium modifiers.

2.2 As regards the closest state of the art, the respondent argued at the oral proceedings that document D2 was the best starting point for assessing inventive step. The appellant was of the opinion that D3 was closer to the claimed subject-matter.

2.2.1 In fact, D3 (see column 1, lines 13 to 20) relates to a process of extracting copper from aqueous solutions with a solution of a water-insoluble hydroxyaryl oxime (ketoxime or aldoxime or mixtures thereof) in a water-immiscible and insoluble organic solvent.

In the embodiment described at column 6, lines 42 to 56, the extractant comprises a mixture of one or more alkylsalicylaldoximes, one or more hydroxyarylketoximes and a linear diester as an equilibrium modifier in an amount providing a degree of modification of the alkylsalicylaldoxime component of from 0.2 to 0.95. In particularly preferred embodiments (column 6, lines 2 to 7 and Table 1), the extractant specifically comprises a mixture of 5-nonylsalicylaldoxime, 5-nonyl-2-hydroxyacetophenone oxime and a linear diester.

2.2.2 For the board, document D3 is the most promising starting point for assessing the inventive step of the claimed subject-matter, since it discloses a copper extractant composition comprising an orthohydroxy-aryl aldoxime, an orthohydroxyaryl ketoxime and an equilibrium modifier with a degree of modification which partly overlaps with the range defined in claim 1 of the patent in suit. D3 moreover requires fewer structural modifications than D2 to arrive at the claimed subject-matter, since the latter document does not use any equilibrium modifier in its examples.

2.3 The problem underlying the patent in suit is described in paragraph [0010] of the specification as providing a composition facilitating higher copper transfer in solvent extraction circuits, i.e. an increased metal recovery which may result in lower O/A ratios, or lower

reagent concentrations for a given recovery. Moreover, the extractant composition is supposed to find particular use with strip solutions having a lower acid concentration.

2.4 As a solution to this problem, the patent proposes a composition according to claim 1 as granted, which is characterised in particular in that the equilibrium modifier is selected from 2,2,4-trimethyl-1,3-pentanediol mono-isobutyrate, 2,2,4-trimethyl-1,3-pentanediol mono-benzoate, 2,2,4-trimethyl-1,3-pentanediol di-isobutyrate, 2,2,4-trimethyl-1,3-pentanediol di-benzoate, isobutyl heptyl ketone, nonanone, 2,6,8-trimethyl-4-nonanone, diundecyl ketone, 5,8-diethyldodecane-6,7-dione, tridecanol, and nonyl phenol in an amount providing a degree of modification of the orthohydroxyaryl aldoximes present of from about 0.2 to 0.61.

2.5 As to whether the problem defined in the patent has been solved, the board notes that there is no evidence on file showing that the claimed composition provides any particular advantage over the compositions known from D3. In this context, i.e. in the absence of an objective comparison with the specific extractant compositions disclosed at column 6, lines 2 to 7 and Table 1 of D3, an improvement cannot be acknowledged and the problem identified in point 2.3 above cannot be considered to have been solved.

2.5.1 The appellant's argument that the claimed extractant compositions would find particular use with lower acid concentration strip solutions cannot be accepted as a particular effect, because the acid concentrations of up to 220 g/l disclosed in the patent in suit (page 7, line 12) are comparable to those disclosed in example 1

of D3 (210 to 220 g/l H_2SO_4; see column 7, lines 62 and 63).

The appellant further argued that it was impossible to provide any comparative test with the specific extractants disclosed in D3, because they were disclosed in terms of ranges (e.g. in table 1: "Diester derived from esterification of a mixture of 5-31% succinic acid, 11-65% glutaric acid, 4-25% adipic acid with a mixture of n-hexanol and n-octanol"). The board cannot accept this argument because, as the patent was revoked for lack of inventive step over D3 and the burden of proof was on appellant, experimental tests with diesters defined in D3 would have been particularly useful, especially if inventive step was supposed to be based on an improvement over the compositions of D3. Since the appellant furthermore had sufficient time to carry out such tests and did not provide any other kind of evidence permitting a comparison between the claimed subject-matter and the teaching of D3, this argument is rejected.

2.5.2 It follows that the problem underlying the patent in suit must be reformulated in less ambitious terms, i.e. as providing an alternative copper extractant composition.

2.5.3 The board is satisfied that this problem has been successfully solved (see the examples of the patent).

2.6 It remains to be decided whether the proposed solution was obvious in the light of the state of the art.

2.6.1 In the board's view, the claimed solution of replacing the specific linear diesters disclosed at column 6, lines 2 to 7 and Table 1 of D3 with the branched

diester 2,2,4-trimethylpentane-1,3-diol diisobutyrate (TXIB) is suggested by the passage at column 7, lines 32 to 36 of D3, which discloses that the use of linear diesters results **in a performance at least equivalent** to that of the highly branched TXIB. Thus the skilled person knew at the priority date of the patent that these two compounds were interchangeable in their function as equilibrium modifiers. The appellant's argument that D3 taught away from using TXIB as an alternative equilibrium modifier is therefore not accepted.

2.6.2 In conclusion, the skilled person seeking an alternative copper extractant composition would arrive without inventive skill at the subject-matter of claim 1 as granted, with the consequence that said claim does not meet the requirements of Article 56 EPC.

3. First auxiliary request - Inventive step

3.1.1 Claim 1 of this request differs from claim 1 of the main request in that the aldoximes are selected from 5-(C_8 to C_{14} alkyl)-2-hydroxybenzaldoximes and the ketoximes from 5-(C_8 to C_{14} alkyl)-2-hydroxyacetophenone oximes.

3.1.2 For the board, these restrictions of the claimed subject-matter do not render it inventive. In the copper extraction process of document D3 (see D3, column 6, lines 2 to 6), specific aldoximes and ketoximes, namely 5-nonylsalicylaldoxime and 5-nonyl-2-hydroxyacetophenone oxime, are disclosed as constituents of the preferred extractant composition which fall under the generic formula of claim 1 of the first auxiliary request. It follows that the reasons in points 2.5 and 2.6 above apply likewise to claim 1 of

this request, which therefore does not meet the requirements of Article 56 EPC.

4. Second auxiliary request - Inventive step

4.1.1 Claim 1 of this request differs from claim 1 of the main request in that the extractant composition is restricted to the specific three compounds used in the examples of the contested patent. These are 2-hydroxy-5-nonylacetophenone oxime, 2-hydroxy-5-nonylsalicylbenzaldoxime and 2,2,4-trimethyl-1,3-pentanediol diisobutyrate as an equilibrium modifier.

4.1.2 In the board's view, this amendment does not make any inventive contribution, since the specific 5-nonyl-salicylaldoxime and 5-nonyl-2-hydroxyacetophenone oxime are the preferred copper extractants of D3 (see column 6, lines 2 to 6). Furthermore, the branched diester 2,2,4-trimethylpentane-1,3-diol diisobutyrate (TXIB) now defined in claim 1 at issue is disclosed in D3 (column 7, lines 32 to 36) as being substantially equivalent in terms of performance with the linear diesters disclosed in the preferred extractant compositions known from D3. It follows that the skilled person seeking an alternative extractant composition would be prompted to substitute the linear diester with the branched TXIB, since he would not expect any substantial loss of performance from doing so, and he would therefore arrive in an obvious manner at the subject-matter of claim 1 at issue.

Claim 1 of the second auxiliary request therefore does not meet the requirements of Article 56 EPC.

5. Third auxiliary request

5.1 Claim 1 of this request differs from claim 1 of the first auxiliary request in that the degree of modification has been restricted from "about 0.2 to 0.61" to "about 0.2 to 0.4".

5.2 Allowability of the amendment - Article 123(2) EPC

According to the appellant, the above restriction of the range has a basis in the passage at page 6, lines 31 to 34, of the application as filed, reading: "*One or more equilibrium modifiers are present in an amount that provides a degree of modification of the orthohydroxyarylaldoximes present of from about* ***0.2*** *to 0.61, more preferably from about 0.3 to 0.59, and most preferably from* ***0.4*** *to 0.6*".

It further argued that said restriction to a range defined by the lower limit of the general range and the lower limit of a preferred range was in line with T 1170/02.

The board acknowledges that the extractant compositions according to experiments 3 to 6 of the contested patent fall within the newly created range, which therefore following T 1170/02, reasons 4.5.2 and 5, complies with Article 123(2) EPC.

5.3 Inventive step

5.3.1 For the board, the restriction of the scope of protection to the range of from "about 0.2 to 0.4" does not make any inventive contribution to the claimed subject-matter, because this range is entirely covered by the broader range of from "0.2 to 0.95" disclosed in document D3, column 3, lines 53 to 56. There is no

reason why the skilled person would not seriously contemplate working within the sub-range now claimed.

5.3.2 Since the restricted range is the sole feature distinguishing the request at issue from the first auxiliary request, the reasons given in point 3.1.2 above - which concern claim 1 of the first auxiliary request - apply *mutatis mutandis* to this request, which thus does not comply with Article 56 EPC.

6. Fourth auxiliary request

6.1 Claim 1 of this request differs from claim 1 of the second auxiliary request in that the degree of modification has been restricted from the range of from "about 0.2 to 0.61" to "about 0.2 to 0.4".

6.2 As regards the allowability of this amendment, the same arguments as in point 5.2 above apply.

6.3 As regards inventive step of claim 1 at issue, the board is of the opinion that the above amendment does not make any inventive contribution to the subject-matter claimed, for the reasons indicated in point 5.3.1 above. Since the restricted range is the sole feature distinguishing the request at issue from the second auxiliary request, the reasons given in point 4.1.2 above - which concern claim 1 of the second auxiliary request - apply *mutatis mutandis* to this request, which thus does not comply with Article 56 EPC.

7. Fifth auxiliary request

7.1 Claim 1 of this request differs from claim 1 of the third auxiliary request in that the degree of

modification has been further restricted from "about 0.2 to 0.4" to "about 0.2 to **0.3**".

7.2 Allowability of the amendment

According to the appellant, the above amendment has a basis in the passage at page 6, lines 31 to 34, of the application as filed, reading: "*One or more equilibrium modifiers are present in an amount that provides a degree of modification of the orthohydroxyarylaldoximes present of from about **0.2** to 0.61, more preferably from about **0.3** to 0.59, ...*".

The board observes that the extractant compositions according to experiments 5 and 6 of the contested patent fall within the newly created range, which therefore, following T 1170/02, reasons 4.5.2 and 5, is allowable under Article 123(2) EPC.

7.3 Inventive step

Since the range of from "about 0.2 to 0.3" falls within the broader range of from "0.2 to 0.95" disclosed in document D3, column 3, lines 53 to 56, the reasons given in point 5.3 above - which concern claim 1 of the third auxiliary request - apply *mutatis mutandis* to the subject-matter of claim 1 of this request, which therefore does not comply with Article 56 EPC.

8. Sixth auxiliary request

8.1 Claim 1 of this request differs from claim 1 of the fourth auxiliary request in that the degree of modification has been further restricted from "about 0.2 to 0.4" to "about 0.2 to **0.3**".

8.2 Since the range of from "about 0.2 to 0.3" falls within the broader range of from "0.2 to 0.95" disclosed in document D3, column 3, lines 53 to 56, the reasons given in point 6.3 above - which concern claim 1 of the fourth auxiliary request - apply *mutatis mutandis* to the subject-matter of claim 1 of this request, which therefore does not comply with Article 56 EPC.

9. As none of the pending requests meets the requirements of the EPC, the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Vodz H. Engl

Decision electronically authenticated