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Datasheet for the decision of 9 January 2024

Case Number: T 0956/21 - 3.2.03

Application Number: 15200771.2

Publication Number: 3034653

IPC: C23C28/04, C23C16/02, C23C16/40

Language of the proceedings: EN

Title of invention:
CVD COATED CUTTING TOOL

Patent Proprietor:
Sandvik Intellectual Property AB

Opponent:
Iscar Ltd.

Headword:

Relevant legal provisions:
RPBA 2020 Art. 12(4), 13(1)
EPC Art. 83, 100(b)

Keyword:
Amendment to case - reasons for submitting amendment in appeal proceedings (yes) - amendment admitted (yes)
Sufficiency of disclosure - undue burden (yes) - enabling disclosure (no)

Decisions cited:
T 0226/85, T 2242/16, T 0409/91, T 0694/92

Catchword:

Europäisches Patentamt
European Patent Office
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Beschwerdekammern

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Case Number: T 0956/21 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 9 January 2024

Appellant: (Patent Proprietor)	Sandvik Intellectual Property AB 811 81 Sandviken (SE)
Representative:	WSL Patentanwälte Partnerschaft mbB Postfach 6145 65051 Wiesbaden (DE)
Respondent: (Opponent)	Iscar Ltd. P.O. Box 11 24959 Tefen (IL)
Representative:	Vossius & Partner Patentanwälte Rechtsanwälte mbB Siebertstrasse 3 81675 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 3 May 2021 revoking European patent No. 3034653 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	C. Herberhold
Members:	B. Miller
	D. Prietzel-Funk

Summary of Facts and Submissions

I. European patent No. 3 034 653 B1 ("the patent") relates to a coated cutting tool comprising a substrate having a surface coated with a chemical vapour deposition (CVD) coating.

II. An opposition against the patent was filed on the grounds of Article 100(b) EPC and Article 100(a) EPC together with Articles 54 and 56 EPC.
The opposition division concluded that the ground for opposition under Article 100(b) EPC prejudiced maintenance of the patent and revoked it.

III. The patent proprietor ("the appellant) appealed the revocation of the patent by the opposition division.

IV. The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted or that the patent be maintained in amended form on the basis of auxiliary requests 1 to 4 as submitted with the reply to opposition dated 26 May 2020 which were re-filed with the statement setting out the grounds of appeal.

The opponent ("the respondent") requested that the appeal be dismissed.

V. Wording of the claims

Claim 1 as granted reads

"Coated cutting tool comprising a substrate coated with a coating comprising a layer of α-Al_2O_3, wherein said α-Al_2O_3 layer exhibits a texture coefficient TC(hkl), as measured by X-ray diffraction using CuKa radiation and θ-2θ scan, defined according to Harris formula

$$TC(hkl) = \frac{I(hkl)}{I_0(hkl)}\left[\frac{1}{n}\sum_{n=1}^{n}\frac{I(hkl)}{I_0(hkl)}\right]^{-1}$$

where I(hkl) is the measured intensity (integrated area) of the (hkl) reflection, I_0(hkl) is the standard intensity according to ICDD's PDF-card No. 00-010-0173, n is the number of reflections used in the calculation, and where the (hkl) reflections used are (104), (110), (113), (024), (116), (214), (300) and (0012)

characterized in that

TC(0012) ≥ 7.2, preferably ≥ 7.4, more preferably ≥ 7.5, more preferably ≥ 7.6, most preferably ≥7.7, and wherein the ratio of I(0012)/I(0114) ≥ 1, preferably ≥ 1.5, more preferably ≥ 1.7, most preferably ≥ 2,

and wherein the coating further comprises a MTCVD TiCN layer located between the substrate and the α-Al_2O_3 layer and wherein the TiCN layer located between the substrate and the α-Al_2O_3 layer exhibits a texture coefficient TC(hkl), as measured by X-ray diffraction using CuKa radiation and θ-2θ scan, defined according to Harris formula where I(hkl) is the measured intensity (integrated area) of the (hkl) reflection, I_0(hkl) is the standard intensity according to ICDD's PDF-card No. 42-1489, n is the number of reflections, reflections used in the calculation are (111), (200), (220), (311), (331), (420), (422) and (511),

wherein TC(220) is ≤ 0.5, preferably ≤ 0.3, more preferably ≤ 0.2, most preferably ≤ 0.1."

It is undisputed that the amendments to claim 1 of each of auxiliary requests 1 to 4 do not address the objections regarding sufficiency of disclosure.

The specific wording of claim 1 of auxiliary requests 1 to 4 is thus not relevant to this decision.

VI. Cited evidence

(a) The following documents from the opposition proceedings are cited in this decision:

D7 Experimental report and declaration prepared by by Mr. Dror Bloch, dated 2 January 2020

D27 Experimental report and declaration - patent experiments prepared by Jan Engqvist, dated 15 December 2020

(b) The following documents were cited for the first time in the appeal proceedings:

- by the appellant

D31 "Handbook of Chemical Vapor Deposition" by Hugh O. Pierson, 2nd edition, William Andrew Publishing, Chapter 1: "Introduction and General Consideration", 1999

D32 Handbook of Deposition Technologies for Films and Coatings, Science, Applications and Technology, 3rd edition, Elsevier, 2010, Chapter 7 "Chemical Vapor Deposition" by Jan-Otto Carlsson

D33 "The Material Science of thin films" by Milton Ohring, Academic Press, 1992, chapter 4.5, pages 167-170

D34 L. F. Pochet et al, "CVD coatings: from cutting tools to aerospace applications and its future potential", Surface and Coatings Technology 94-95 (1997) 70-75

D35 Bernex: CVD Coating System - Operating manual and safety instructions, overview and chapter 7.5

D36a EP 0 5140 32 Al

D36b EP 2 507 409 Bl

D36c EP 2 534 275 Bl

D36d EP 2 559 504 Al

D36e EP 3 037 196 Al

D36f JPS52105396 A, engl. translation

D36g US 2010/0296883 Al

D50 Experimental report and declaration - patent experiments prepared by J. Engqvist, dated 25 May 2022

- by the respondent:

D37a Experimental report and declaration prepared by Dror Bloch, dated 26 January 2022

D37b Experimental report and declaration prepared by Lee Eun Soo, dated 26 January 2022

D38 Screenshots from Bernex Ion Bond 530L user interface

D39 C. Århammar et al., "A theoretical study of possible point defects incorporated into α-alumina deposited by chemical vapor deposition", Theor Chem Acc (2014) 133:1433

D40 A. Blomqvist et al., "Understanding the catalytic effects of H_2S on CVD-growth of α-

alumina: Thermodynamic gas-phase simulations and density functional theory", Surface & Coatings Technology 206 (2011) 1771-1779

D41 E. Fredriksson et al., "Chemical vapour deposition of Al_2O_3 on TiO", Thin Solid Films 263 (1995) 28-36

D42 H. Kodama et al., "Studies on Improving the Thickness Uniformity of Alumina Film Coated on Cemented Carbide by CVD", Japan Society of Powder and Powder Metallurgy, 1995 Volume 42 Issue 4 Pages 528-531

D42' Machine translation of D42

D43 M. Fallqvist et al., "Abrasive Wear of texture-controlled CVD α-Al_2O_3 coatings", Surface & Coatings Technology 202 (2007) 837- 843

D44 S. Ruppi, "Enhanced performance of α-Al_2O_3 coatings by control of crystal orientation", Surface & Coatings Technology 202 (2008) 4257-4269

D45 S. Ruppi, "Deposition, microstructure and properties of texture controlled CVD α-Al_2O_3 coatings", International Journal of Refractory Metals & Hard Materials (2005)

D46 S. Ruppi et al., "Nanoindentation hardness, texture and microstructure of α-Al_2O_3 and κ-Al_2O_3 coatings", Thin Solid Films 516 (2008) 5959–5966

D47 R. M'Saoubi et al., "Wear and thermal behaviour of CVD α-Al_2O_3 and MTCVD Ti(C,N) coatings during machining", CIRP Annals - Manufacturing Technology 58 (2009) 57–60

D48 C. Czettl et al., "CO addition in low-pressure chemical vapour deposition of medium-temperature TiC_xN_{1-x} based hard coatings", Surface & Coatings Technology 206 (2011) 1691-1697

D49 C. Czettl, "Design for CVD coatings for Cutting Tools", PhD thesis, Montanuniversität Leoben, November 2013

VII. With the summons to oral proceedings, the Board sent a communication pursuant to Article 15(1) RPBA 2020 informing the parties of its preliminary opinion on the case, i.e. that the Board saw no reason to deviate from the finding of the opposition division.

VIII. Oral proceedings were held on 9 January 2024 by videoconference.

IX. The appellant's arguments, as far as they are relevant to this decision, can be summarised as follows.

(a) Admission of documents D31 to D36

D31-D34 were basic handbooks or review articles representing common general knowledge. It was established practice before the Boards of Appeal that handbooks and review articles could also be introduced as evidence at the appeal stage in order to demonstrate general technical knowledge contested in the first instance proceedings.

D35 and D36a to D36g were filed in direct response to the opposition division's objection, raised for the first time in the oral proceedings, that the term "continuous change" disclosed in paragraph [0032] of the patent was allegedly unclear.

(b) Admission of documents D37 to D49

Documents D37 to D49 could and should have been filed by the respondent during the opposition proceedings.

Moreover, these documents were not relevant to the present case.

(c) Admission of document D50

D50 was filed in response to the respondent's submission. It demonstrated that the deposition conditions for applying the bonding layer influenced the texture of the subsequent α-Al_2O_3 layer.

(d) Main request - sufficiency

D7 was not appropriate evidence for a lack of sufficiency, since the experiments reported in D7:

- differed from the results reported in the notice of opposition and therefore were not reliable;
- did not represent a correct and accurate reworking of the patent's examples. According to D7, the bonding layer was not correctly applied in line with paragraph [0032] of the patent. Moreover, the substrate used for the experiments of D7 differed from the substrate used for the examples of the patent;
- did not report the various parameter values such as the thickness of the individual layers or the total gas flow;
- were based on inappropriate and unstable working conditions;
- resulted from samples of inserts from specific positions in the CVD furnace, which were deliberately singled out in a scientifically inappropriate manner as evidenced by D27. The skilled person would immediately realise that a higher gas flow would have been needed in the experiments of D7 to obtain the required texture of the α-Al_2O_3 layer.

Moreover, D27 demonstrated that by using conventional process conditions (e.g. a total gas flow of 4300 l/h) the skilled person was able to produce - in the majority of cases - cutting tool inserts wherein the required texture of the α-Al_2O_3 layer was obtained for the majority of the inserts.

The examples of the patent illustrated how cutting tools according to claim 1 could be obtained.

(e) Auxiliary requests 1 - 4

Concerning sufficiency of disclosure, the same arguments as presented for the main request applied also to the invention as defined in claim 1 of auxiliary requests 1 to 4.

X. The respondent's counter-arguments can be summarised as follows.

(a) Admission of documents D31 to D36

Documents D31 to D36 should have been filed in the opposition proceedings. Furthermore, these documents were not *prima facie* relevant.

(b) Admission of documents D37 to D49

D37 to D49 addressed the appellant's arguments submitted in its statement setting out the grounds of appeal.

(c) Admission of document D50

D7 had been filed with the notice of opposition and formed the basis for the preliminary opinion by the opposition division. The appellant could and should have filed the corresponding alleged counter-evidence D50 in the opposition proceedings. Moreover, according to the patent, neither the presence of a bonding layer nor the use of specific deposition conditions such as a "CO ramp" was essential. Therefore, the experimental results of D50 were not relevant.

(d) Main request - sufficiency

During the opposition proceedings, two sets of experiments had been performed. One had already been summarised in the notice of opposition. Another one had been reported in D7 in more detail. Both sets of experiments demonstrated that the patent did not enable the skilled person to rework the invention.

D7 represented a correct and accurate reworking of the patent’s examples taking into account the overall general teaching of the patent. The alleged deviations from the very detailed example of the patent only concerned non-essential features, such as the conditions for applying the bonding layer or the composition of the substrate. Despite these marginal deviations, D7 demonstrated that the invention as defined by the claims of the patent could not be reworked over the whole scope.

Moreover, the level of detail presented by D7 was sufficient to verify the test results of D7 and corresponded to the level of detail presented in the examples of the patent. D7 was based on appropriate and

conventional deposition conditions available in a standard CVD furnace as proposed in the patent.

D27 did not provide evidence that the invention was sufficiently disclosed but rather implied that the total gas flow was crucial for achieving the required texture. However, the patent did not provide any teaching concerning the total gas flow or stipulate that a minimum total gas flow was necessary to obtain an α-Al_2O_3 layer having the texture as defined in claim 1. This was also not derivable from the common general knowledge.

The total flow rate used in the experiments of D7 was sufficient to obtain coatings which fulfilled all further parameters and features of claim 1 except the magnitude of TC(0012). Thus, there was no reason to conclude that the results obtained by D7 might be the consequence of unstable working conditions or incorrect sampling.

Moreover, D27 did not demonstrate that the patent enabled the skilled person to choose appropriate deposition conditions to obtain at least a majority of inserts according to claim 1, since the patent neither disclosed the required total gas flow nor suggested focusing only on samples which had been positioned in the inner volume of the furnace.

(e) Auxiliary requests 1 to 4

Concerning sufficiency of disclosure, the same arguments as presented for the main request applied also to the invention as defined in claim 1 of auxiliary requests 1 to 4.

Reasons for the Decision

1. Admission of documents D31 to D50

1.1 The appellant filed documents D31 to D36g with the statement setting out the grounds of appeal and the experimental report D50 with a further letter dated 25 May 2022. The respondent filed D37 to D49 together with its reply to the appeal.

Both parties argued that
- the evidence they had filed had been submitted in response to the arguments of the other party or the reasoning in the contested decision,
- this was not the case for the evidence submitted by the respective other party and that the documents submitted by the other party were not relevant.

1.2 The Board concluded that documents D31 to D50 had been filed in response to the decision and the respective arguments presented by the other party. Moreover, all these documents relate to the ground of opposition underlying the contested decision.

Hence, the Board admitted documents D31 to D50 into the appeal proceedings (Article 12(4) and 13(1) RPBA 2020).

2. Article 100(b) EPC

2.1 In line with the established case law of the Boards of Appeal, a successful objection of lack of sufficiency of disclosure presupposes that there are serious doubts, substantiated by verifiable facts (see Case Law of the Boards of Appeal, 10th edition, 2022, Chapter II.C.9.). In order to establish insufficiency, the burden of proof is upon an opponent to establish that, on the balance of probabilities, a skilled reader of the patent, using common general knowledge, would be unable to carry out the invention.

The opposition division concluded that this evidence had been provided by the declaration and experimental report D7. The corresponding counter-evidence D27 filed by the appellant during the opposition proceedings was considered by the opposition division to even further demonstrate that the invention was insufficiently disclosed in the patent.

The Board sees no reason to deviate from this finding of the opposition division.

2.2 The invention as defined in claim 1 as granted concerns a coated cutting tool comprising a substrate, a layer of α-Al_2O_3 and a MTCVD TiCN layer located between the substrate and the α-Al_2O_3 layer.
The α-Al_2O_3 layer and the TiCN layer are characterised by their texture. The α-Al_2O_3 layer is required to have a texture with TC(0012) $\geq$ 7.2, wherein the ratio of I(0012)/I(0114) is $\geq$ 1. The TiCN layer is required to have a texture with TC(220) $\leq$ 0.5.

2.3 The parties agree that the texture of a coating is significantly influenced by the deposition conditions used.

It follows that the skilled person has to know how to choose the appropriate deposition conditions to obtain a cutting tool insert comprising an α-Al_2O_3 layer and a MTCVD TiCN layer as required by claim 1.

2.4 Whether or not the disclosure of the patent is sufficiently complete within the meaning of Article 83 EPC must be decided by appraising the information contained in the patent specification in the light of the common general knowledge of the skilled person at the priority date.

2.5 With regard to the MTCVD TiCN layer, it is undisputed that the patent describes in paragraph [0014] one way of achieving a low TC(220) by adjusting the volume ratio of $TiCl_4/CH_3CN$ in an initial part of the MTCVD TiCN deposition to a relatively high level. This teaching in paragraph [0014] is in line with the deposition method of the examples of the patent. The TiCN layers for the samples according to the invention (samples E13C-1, E13C-2, E29C-1, E29C-2, E30C-1, E30C-2, E35C-1 and E35C-2) are obtained accordingly by applying the following method step (see [0030] and [0031] of the patent):

"The volume ratio of $TiCl_4/CH_3CN$ in an initial part of the MTCVD deposition of the TiCN layer was 6.6, followed by a period using a ratio of $TiCl_4/CH_3CN$ of 3.7."

In line with the arguments presented by the parties, it follows that the patent provides sufficient information

for the skilled person to obtain a MTCVD TiCN as required by claim 1.

2.6 However, this is not the case regarding the α-Al_2O_3 coating.

The patent discloses in paragraph [0008] in general that it is typically deposited by thermal CVD. The only further information on how to obtain an α-Al_2O_3 coating with the texture as defined in claim 1 can be found in paragraph [0014] where it is stated in relation to the TiCN layer that

"A low intensity from the (220) has shown to be advantageous in that it seems to promote a strong <001> texture of the subsequent α-Al_2O_3 layer."

In addition to this statement in paragraph [0014], the general patent specification does not provide any guidance for the skilled person as to how the α-Al_2O_3 layer having the required texture can be obtained. In particular, the patent does not describe in general which process parameters of the deposition process are of particular importance.

The examples of the patent describe a very detailed manufacturing method. However, this exemplified method encompasses a lot of process steps and settings (such as a "CO ramp") relating to the production of non-claimed details (such as a bonding layer), these process steps being non-essential in regard to the manufacture of a cutting tool insert according to claim 1 but still having have an influence on the texture as argued by the appellant (see point 2.10 below).

2.7 The experimental data presented in Table 2 of D7 raised serious doubts as to whether the skilled person could rework the invention over the whole scope of protection based on the general disclosure of the patent specification while taking into account the examples of the patent.

2.7.1 In point 3 of D7, it is stated that the experiments followed the procedure described in paragraphs [0031] to [0037] of the patent. This is confirmed by the process conditions summarised in Table 1 of D7. The experiments of D7 come very close to the specific conditions used for the examples of the patent, since the various process conditions (furnace type, pressure, temperature and concentration of reactants in vol.%) used for the deposition process of the essential layers, i.e. the TiCN and α-Al_2O_3 layer, correspond to the process conditions presented in the examples of the patent (see paragraphs [0031] and [0033]-[0034]).

It follows that the teaching of the patent has been reworked in a bona fide manner by D7.

2.7.2 D7 demonstrates that the provision of a TiCN layer having a texture with TC(220) $\leq$ 0.5 (see the right-hand column of Table 2 reproduced below) is not sufficient to obtain a subsequent α-Al_2O_3 layer having a texture with TC(0012) $\geq$ 7.2 (see column TC(0,0,12) below) as required by claim 1.

Table 2

Sample	Tray number and position	α-Al_2O_3 layer		MT-TiCN layer
		TC (0,0,12)	$I_{(0\,0\,12)}/I_{(0\,1\,14)}$	TC (220)
A	10 outer	**6.79**	1.3	0.28
B	20 outer	**7.15**	1.05	0.22
C	30 outer	**6.43**	0.89	0.23
D	40 middle	**7.06**	1.07	0.12
E	40 outer	**6.33**	**0.26**	0.21

Hence, D7 demonstrates that the teaching in paragraph [0014] of the patent does not enable the skilled person to produce the α-Al_2O_3 layer with the required texture and thus to rework the invention. As discussed above, no further guidance can be found in the patent as to which parameters of the deposition process should be observed and adjusted to obtain the required texture of the α-Al_2O_3 layer.

The results presented in D7 therefore raise serious doubts as to whether the skilled person can obtain a coated cutting tool over the whole scope of claim 1.

2.8 The appellant argues that D7 was not an appropriate proof of lack of sufficiency, since the experiments reported in D7

1) differed from the experiments reported in the notice of opposition and therefore were not reliable;
2) did not represent a correct and accurate reworking of the patent's examples. In particular the bonding layer was not correctly applied in line with paragraph [0032] of the patent. Moreover, the substrate used for the experiments of D7 differed from the substrate used for the examples of the patent;
3) did not report the various parameter values such as the thickness of the individual layers or the total gas flow;
4) were based on inappropriate and unstable working conditions;
5) resulted from samples of inserts from specific positions in the CVD furnace, which were deliberately singled out in a scientifically inappropriate manner as evidenced by D27. The skilled person would immediately realise that a higher gas flow would have been needed in the experiments of D7 to obtain the required texture of the α-Al_2O_3 layer. Alternatively, the skilled person would have focused on the inserts placed at an inner position on the trays of the furnace to obtain coated inserts according to claim 1.

These arguments are not convincing.

2.8.1 The respondent confirmed during the oral proceedings before the Board that two sets of experiments had been performed during the opposition proceedings. The

results of a first set of experiments were summarised in the notice of opposition. The more detailed results of a second set of experiments had been filed as D7. Although the specific test results of both experiments differ to a certain extent, the respondent concluded in both cases that inserts according to claim 1 cannot be obtained by using standard deposition conditions. Performing two sets of experiments and focusing on the experiments which have been documented in more detail demonstrates the willingness of the respondent to present its best case. The citation of further experiments in the notice of opposition does not imply that the results of D7 are unreliable or implausible and therefore cannot be considered.

2.8.2 As discussed above, the experiments of D7 come very close to the specific conditions used in the examples of the patent, since the various process conditions (furnace type, pressure, temperature and concentration of reactants in vol.%) used for the deposition process of the essential TiCN and α-Al_2O_3 layer as summarised in Table 1 of D7 correspond to the process conditions presented in the examples of the patent (see paragraphs [0031] and [0033]-[0034]).

The experiments of D7 differ from the detailed examples of the patent in the deposition conditions of the bonding layer (D7: two-step process without "CO ramp", patent: four-step process with "CO ramp") and the composition of the substrate.

As emphasised and confirmed by the appellant, the presence of a bonding layer and, if present, its method of deposition as well as the composition of the substrate are non-essential features, see paragraphs [0013] and [0016] ("in one embodiment"). Moreover, no

teaching is provided that the bonding layer, its specific deposition method or the composition of the substrate are decisive for obtaining the required texture.

The minor deviations from the very specific examples of the patent regarding optional, non-essential features cannot be considered as a critical deviation which renders the experiments of D7 irrelevant or uncredible.

Contrary to the view of the appellant, it is not required in order to challenge sufficiency of disclosure for each and every detail of the examples of the patent to be repeated, see T 226/85 (point 3 of the Reasons) or T 2242/16 (point 3.7.5 of the Reasons).

Moreover, the requirement for sufficiency of disclosure implies that the skilled person has to be able to rework the invention over the whole scope and not only when following a very specific and detailed embodiment.

The Board therefore concludes that although the experiments of D7 deviate slightly from the specific example of the patent, they nevertheless represent the teaching of the patent and are an appropriate repetition of the teaching of the patent which can be considered for assessing sufficiency of disclosure.

2.8.3 D7 discloses the thickness of the various coating layers in Table 1. The Board considers it credible that the thicknesses reported in Table 1 correspond to the thicknesses which have been obtained and measured in the experiments of D7, since it is stated in D7 "I have deposited a coating ... using the process parameters shown in Table 1".

Moreover, similar to the discussion above, the thicknesses of the coating layers are neither defined in claim 1 nor discussed in the general part of the description as being decisive for obtaining a cutting tool comprising an α-Al_2O_3 with a texture according to claim 1. Hence, concerning the issue of sufficiency of disclosure, which concrete and specific thickness has been obtained for each coating layer is not decisive provided the thickness falls within the conventional ranges as taught by the patent. This is clearly the case, since the thicknesses reported in D7 correspond to the thicknesses obtained by the examples of the patent.

The same applies with regard to total gas flow. The patent does not address total gas flow at all. Hence, the patent does not disclose which total gas flow has been used in the examples and does not teach that total gas flow is important in achieving the required texture.

Correspondingly, the lack of disclosure in D7 of the values for the specific thickness of the various coating layers and of the total gas flow does not prevent the skilled person from verifying the facts of D7 to the extent that they are relevant in the context of the invention as defined in claim 1 of the patent. Regarding the essential features of claim 1 of the patent, D7 presents its experiments to the same level of detail as the patent.

2.8.4 Concerning the argument that the experiments reported in D7 were based on inappropriate and unstable working conditions, the Board observes that Tables 1 and 2 of D7 demonstrate that the obtained cutting tool inserts have a layered coating which fulfils the requirements

of claim 1 of the patent concerning the MTCVD TiCN layer - including its particular required texture - and the ratio of I(0012)/I(0114) of the α-Al_2O_3 layer.

The mere fact that the texture of the α-Al_2O_3 coating does not also fulfil the further requirement of claim 1 (TC(0012) $\geq$ 7.2) is not evidence *per se* of unstable and inappropriate working conditions such as the application of an insufficient total gas flow. This is also not derivable from the patent, since the patent does not disclose that a minimum total gas flow should be used.

Moreover, according to Table 1 of D7, inserts having a coating with the target thickness corresponding to the thickness disclosed in the examples of the patent are obtained in a conventional time span. Thus, sufficient reactants were available during the deposition process of D7 and it cannot be concluded that depletion of reactants occurred in the extreme manner in the "highest" and/or "outer" positions of the reactor as argued by the appellant or that unstable deposition conditions were used for the experiments of D7.

2.8.5 Regarding the appellant's argument that the mere sampling of inserts from positions in the outer volume of the CVD reactor would be the reason that the respondent failed to obtain inserts according to claim 1, the Board observes that the experimental results reported in D37a and D37b (see the results of D37b represented below) confirm the results of D7 irrespective of the positioning of the insert in the reaction chamber (see the columns TC (0,0,12) of α-Al_2O_3 and TC (220) of MT-TiCN).

IC61

Sample	Coating Thickness (um)		Results of XRD analysis			Infringement
	MT-TiCN	α-Al_2O_3	TC (0,0,12) of α-Al_2O_3	I (0,0,12) / I (0,1,14) ratio of α-Al_2O_3	TC (220) MT-TiCN	
10 inner	4.8	4.2	7.14	0.66	0.37	X
20 middle	4.5	3.9	4.93	0.46	0.63	X
30 inner	5.4	4.5	6.80	0.62	0.52	X
30 middle	5.3	4.6	6.20	0.68	0.53	X
30 outer	4.6	3.8	5.20	0.47	0.74	X
40 outer	4.5	3.8	2.96	0.43	0.71	X
Range of infringement in claim of EP3034653	2~15	2~15	> 7.2	> 1.0	< 0.5	

IC69

Sample	Coating Thickness (um)		Results of XRD analysis			Infringement
	MT-TiCN	α-Al_2O_3	TC (0,0,12) of α-Al_2O_3	I (0,0,12) / I (0,1,14) ratio of α-Al_2O_3	TC (220) MT-TiCN	
10 inner	4.8	4.2	6.31	1.25	0.15	X
20 middle	4.5	3.9	5.79	0.70	0.36	X
30 inner	5.4	4.5	7.09	1.10	0.26	X
30 middle	5.3	4.6	6.51	0.75	0.40	X
30 outer	4.6	3.8	5.63	0.62	0.34	X
40 outer	4.5	3.8	1.39	0.51	0.42	X
Range of infringement in claim of EP3034653	2~15	2~15	> 7.2	> 1.0	< 0.5	

Therefore, the experiments according to D7 and D37b do not support the appellant's argument that the opponent was not able to rework the invention simply due to inappropriate sampling.

Even if the appellant's argument with reference to D27 that in the experiments of D7 the total gas flow was not adjusted high enough to obtain the required texture for α-Al_2O_3 layer at the selected outer positions too were to be accepted, this would not lead to the conclusion that the skilled person can rework the invention contrary to the finding in D7.

The Board agrees with the appellant's view that adjustment of the total gas flow volume for a given CVD-reactor for controlling the mass transport and surface kinetics of the deposition process falls within the customary practice of the skilled person as evidenced for example by D32 (see page 433, second to last paragraph). Hence, it is not always necessarily required to disclose it in a patent application as evidenced by D36a to D36e. Moreover, it can be accepted that various mass flow controllers (MFC) are available on the market and can be used for CVD furnaces.

However, the patent does not disclose that the total gas flow is important for achieving the specific α-Al_2O_3 texture as required by claim 1. Moreover, no general knowledge exists regarding the total gas flow having to have a minimum value to obtain an α-Al_2O_3 layer with the particular texture of claim 1. Moreover, the Board is not aware of any common general knowledge regarding the deposition process having to be adjusted to specific surface kinetics in order to obtain an α-Al_2O_3 layer in the texture as defined in claim 1 and nor is this derivable from D32, page 433, to which the appellant made reference, or disclosed in the patent.

Hence, confronted with the experimental results presented in Table 2 of D7 the skilled person has no reason to expect that the required texture could be obtained in the present case if the total gas flow was increased to a value such as 6450 l/h (see Table 1 of D27).

Finally, the appellant has not demonstrated that a total gas flow rate of 6450 l/h as used in the

experiments of D27 (Table 1) is conventional and therefore would be considered by the skilled person as part of their routine experimentation. On the contrary, documents D39 (Table 1), D40 (Table 2), D41 (page 30, right-hand column, last paragraph) and D42 (first two paragraphs of point 3. "Trial results") demonstrate that far lower total flow rates are conventionally used to deposit an α-Al_2O_3 layer.

2.9 The appellant further argues based on Table 4 of D27 that the skilled person could obtain coated inserts according to claim 1 and that a certain amount of failure was not proof of insufficiency. The appellant concludes by reference to D27 that the skilled person would be able to rework the invention, since they could use a total gas flow of 4300 l/h and would obtain a majority of inserts according to claim 1 within the inner volume ("Bott(7cm) inner+middle", "Middle (47cm) inner+middle" and "Top (90cm) inner") of the CVD furnace.

This argument is also not convincing.

2.9.1 The experiments of D27 made use of two different total gas flow rates. The experiments summarised in Table 2 are supposed to represent the experiments with an allegedly insufficient total gas flow of 4300 l/h. The results of D27 obtained by the deposition process with a total gas flow of 4300 l/h confirm the results of D7 that in the outer volume at the positions "Bott(7cm) outer", "Middle (47cm) outer", "Top (90cm) middle" and "Top (90cm) outer" within the furnace the coating process does not produce inserts according to claim 1.

2.9.2 In line with established case law (see Case Law of the Boards of Appeal, 10th edition, 2022, Chapter C.II.

6.7), the Board agrees that a certain amount of failure does not prevent the skilled person from reworking the invention.

2.9.3 However, in the present case, the appellant's argument is not based on the disclosure of the patent. The patent does not provide guidance regarding the use of a total gas flow of at least 4300 l/h. Therefore, starting from the patent, it cannot be concluded that the skilled person would use deposition conditions as used in D27 and would obtain at least a majority of inserts according to claim 1. The same applies with regard to the positioning of the samples. The patent does not provide any information suggesting that, when conventional deposition methods are used, only the inner volume of a CVD furnace should be used.

2.9.4 Furthermore, D37b demonstrates that, under conditions similar to D27, the inserts at the inner positions of the furnace may also not meet the requirements of claim 1. Hence, it cannot be concluded that the teaching of the patent or even D27 enables the skilled person over the whole scope of claim 1 to obtain inserts at least within the inner volume of the furnace.

2.9.5 Moreover, even if the skilled person were to adjust the total gas flow to about 4300 l/h for any reason, it cannot be concluded that the results demonstrated in D27 would be considered at least to be partially successful in obtaining inserts according to claim 1. The manufacturing process in question takes place in a furnace for mass production containing 10000 inserts, see paragraph [0023] of the patent. A successful mass production process requires that the inserts in the furnace have to be coated more or less in the same manner. A process wherein the skilled person would be

required to analyse and sort out a substantial amount of inserts after the coating process would not be considered a successful reworking of the mass production process as envisaged by the patent.

2.10 Whether or not the disclosure of the patent in suit is sufficiently clear and complete within the meaning of Article 83 EPC must be further decided by appraising the information contained in the examples in the light of the common general knowledge of the skilled person at the priority date (Case Law of the Boards of Appeal, 10th edition, 2022, Chapter II.C.5.3)

The appellant accordingly argues that the skilled person could obtain coated tool inserts according to claim 1 by following the specific examples of the patent, since the examples would appear to describe a detailed manufacturing process.

However, even if this reasoning by the appellant were to be accepted for the sake of argument, this does not necessarily demonstrate that the invention is sufficiently disclosed.

The disclosure of one way of performing an invention (for instance by describing a specific example) is only sufficient if it allows the invention to be performed in the whole scope claimed (see Case Law of the Boards of Appeal, 10th edition, 2022, Chapter II.C.5.4, see in particular also the decisions cited in the previous Chapter II.C.5.3 Examples: T 226/85 (point 3 of the Reasons), T 409/91 (point 3.5 of the Reasons), T 694/92 (point 5 of the Reasons) or T2242/16 (point 3.7.5 of the Reasons).

In the present case, the appellant's arguments with regard to the experiments in D7 and D50 confirm that any minor deviation from the very detailed and very specific method described in the examples of the patent may be expected to result in failure to obtain the required texture of the α-Al_2O_3 layer even if these specific method steps relate to the manufacture of a non-essential bonding layer which is not required according to claim 1. For example, applying a bonding layer in four different manufacturing steps as suggested by paragraph [0032] of the patent but without using the continuously changing CO concentration (referred to as "CO ramp" by the appellant) is seen by the appellant as a possible reason why the coated inserts obtained according to D7 do not have a texture as required by claim 1, see statement of grounds of appeal section V.C) (page 27ff of the statement of grounds). The same applies with regard to the gas flow rates, the position of the samples within the CVD reactor, the thickness of the coating layers, etc.

None of the allegedly critical deviations from the specific manufacturing method described in paragraphs [0031] to [0037] of the patent, which have been identified by the appellant, are discussed either in the experimental section or the general part of the patent as being critical to achievement of the desired coating texture. Moreover, it is not disclosed in the patent how to adjust these parameters in the case of failure or in the event of deviation from the very specific method described in paragraphs [0031] to [0037] of the patent.

In other words, the patent does not provide any teaching which might guide the skilled person to obtain coated cutting tool inserts according to claim 1 in the

event of deviation from the very specific exemplary manufacturing method described in the example.

2.11 In view of the above, the Board concludes that the ground of opposition pursuant to Article 100(b) EPC prejudices maintenance of the patent, as was correctly assumed in the impugned decision.

3. Auxiliary requests 1 to 4

In line with both parties' arguments, the arguments relating to the sufficiency of the main request apply *mutatis mutandis* to the auxiliary requests.

Thus, the appeal must fail.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Spira C. Herberhold

Decision electronically authenticated