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**D E C I S I O N**  
**of 5 December 2001**

**Case Number:** T 0727/98 - 3.3.1

**Application Number:** 95915622.5

**Publication Number:** 0758325

**IPC:** C07D 251/70

**Language of the proceedings:** EN

**Title of invention:**

A process for preparing isocyanate and isocyanate-based derivatives of certain amino-1,3,5-triazines by direct phosgenation

**Applicant:**

CYTEC TECHNOLOGY CORP.

**Opponent:**

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**Headword:**

Trisisocyanatotriazines/CYTEC

**Relevant legal provisions:**

EPC Art. 56, 111, 123(2)

**Keyword:**

"Amendments (allowable) - combination of general and preferred ranges"

"Inventive step (yes) - determination of the closest prior art for process claim - deterrent teaching of the state of the art"

**Decisions cited:**

T 0002/81, T 0641/89, T 0020/94

**Catchword:**

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Boards of Appeal

Chambres de recours

**Case Number:** T 0727/98 - 3.3.1

**D E C I S I O N**  
**of the Technical Board of Appeal 3.3.1**  
**of 5 December 2001**

**Appellant:** CYTEC TECHNOLOGY CORP.  
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**Representative:** DIEHL, GLAESER, HILTL & PARTNER  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 17 March 1998  
refusing European patent application  
No. 95 915 622.5 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** A. J. Nuss  
**Members:** R. Freimuth  
R. T. Menapace

## Summary of Facts and Submissions

- I. The appeal lodged on 15 May 1998 lies from the decision of the Examining Division posted on 13 March 1998 refusing European patent application No. 95 915 622.5 (European publication No. 758 325) which was filed as international application published as WO 95/30663.
- II. The decision under appeal was based on claims 1 to 15 as originally filed. The Examining Division found that the subject-matter of the claims lacked inventive step based on the documents
- (A) US-A-3 919 221 and
- (B) US-A-4 939 213.

The Examining Division held that the process described in document (B) differed from the claimed process only in using oxalylchloride instead of phosgene in the reaction with an amino-1,3,5-triazine, e.g. melamine. Document (A) taught to perform the transformation of an amino-1,3,5-triazine into the isocyanato derivative thereof by using phosgene. Thus, the skilled person seeking to provide a further process for transforming an aminotriazine into the isocyanato derivative thereof would combine the teaching of document (A) with that of (B) thereby arriving without any inventive effort at the process claimed.

The Examining Division found that document (A) did not describe the use of any sealed reactor for performing the reaction of the amino-1,3,5-triazine with phosgene; nor did the present application. Thus, a sealed reactor was not mandatory for successfully performing that

reaction. Inventive step was neither supported by the feature comprised in claim 1 of removing a portion of the hydrogen chloride during the reaction as it was generated since no unexpected effect was linked therewith.

III. At the oral proceedings before the Board, held on 5 December 2001, the Appellant (Applicant) submitted fresh claims 1 to 8, claim 1 reading as follows:

"1. A process for preparing at least trisisocyanate functional derivatives by contacting (i) an amino-1,3,5-triazine and (ii) phosgene in a reaction system, at a temperature of 51.4°C to 120°C, a pressure of 50 psig ( $3.45 \times 10^5$  Pa) to 1000 psig ( $6.9 \times 10^6$  Pa) and for a length of time sufficient to produce an isocyanate functional 1,3,5-triazine derivative and hydrogen chloride, whereby the amino-1,3,5-triazine is an (at least tris-unsubstituted amino)-1,3,5-triazine, the reaction is conducted under conditions whereby the hydrogen chloride is gaseous and the phosgene is refluxed, and at least a portion of the hydrogen chloride is removed from the reaction system as such hydrogen chloride is generated during the reaction of (i) and (ii) by passing an inert gas through the pressurized and heated reaction system during the reaction."

Independent claim 5 was directed to a process for preparing at least trisisocyanate-based derivatives by preparing in a first step the at least trisisocyanate functional derivatives of an amino-1,3,5-triazine according to the process of claim 1 and by reacting in a second step these trisisocyanate functional derivatives with an isocyanate-reactive material.

Claims 2 to 4 and 6 to 8 were dependent on claims 1 and 5, respectively.

- IV. The Appellant argued that either document (A) or (B) could be regarded as the closest prior art and starting point in the assessment of inventive step. Document (B) described a process for preparing the same trisisocyanate functional derivatives of a trisamino-1,3,5-triazine as the claimed process. The process of the art used oxalylchloride as reactant. The present application aimed at providing a further process for preparing those particular trisisocyanates. An essential feature of the claimed process using phosgene as reactant was to remove a portion of the hydrogen chloride during the reaction as it was generated. The phosgenation process of mono/diamino-1,3,5-triazines described in document (A) was mandatorily performed at a temperature not below 150°C, whereas the reaction temperature of the claimed phosgenation process did not exceed 120°C. Thus, document (A) gave no hint to the skilled person to arrive at the claimed process.
- V. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the set of eight claims submitted during the oral proceedings.
- VI. At the end of the oral proceedings the decision of the Board was announced.

### **Reasons for the Decision**

1. The appeal is admissible.

2. *Amendments (Article 123(2) EPC)*

Claim 1 as amended results from combining original claim 1 with the specific embodiment of original claim 5. The preparation of at least trisisocyanate functional derivatives in the claimed process is supported by page 3, lines 21 and 22 and page 5, lines 21 and 22 of the application as filed. The feature of passing an inert gas through the pressurized and heated reaction system during the reaction is found on page 9, lines 32 and 33 of the application as filed. The pressure range of 50 psig to 1000 psig finds support on page 10, line 17 of the application as filed, while the conversion of those original values into the SI-unit "Pascal" has been corrected by applying the proper conversion factor. Claim 1 specifies a temperature range of 51.4°C to 120°C. Page 10, lines 14 and 15 of the application as filed indicates a general range of 51.4°C to 182°C and a preferred range of 100°C to 120°C included in that general range. Both endpoints of the claimed range of 51.4°C and 120°C being specifically named in the application as filed, this amendment does not generate any new subject-matter within the meaning of Article 123(2) EPC (see decision T 2/81, OJ EPO 1982, 394, point 3 of the reasons). Claims 2 to 8 are based on original claims 10 to 15.

For these reasons, the Board concludes that claims 1 to 8 meet the requirements of Article 123(2) EPC.

3. *Novelty*

The Board is also satisfied that the subject-matter as defined in the present claims is novel and meets the

requirements of Article 54 EPC. Since novelty has already been acknowledged by the Examining Division in the decision under appeal for the then pending claims which were broader in scope than those present, it is not necessary to give detailed reasons for that finding.

4. *Inventive step*

It remains to decide whether or not the subject-matter of the present claims involves an inventive step as required by Article 56 EPC.

4.1 In accordance with the "problem-solution approach" consistently applied by the Boards of Appeal to assess inventive step on an objective basis, it is necessary to establish the closest state of the art being the starting point, to determine in the light thereof the technical problem which the invention addresses and successfully solves, and to examine the obviousness of the claimed solution to this problem in view of the state of the art.

4.2 The present application aims at preparing at least trisisocyanate functional derivatives of (at least tris-unsubstituted amino)-1,3,5-triazines. These trisisocyanate functional derivatives already belong to the state of the art. In Example 1, document (B) teaches the preparation of melamine triisocyanate which is the trisisocyanate functional derivative of a tris-unsubstituted amino-1,3,5-triazine, namely melamine. According to the process specifically described in document (B) the melamine triisocyanate is prepared by reacting melamine with oxalylchloride while boiling under reflux using excess oxalylchloride as solvent



(Example 1 and column 4, line 14). Thus, the reaction temperature is the boiling point of oxalylchloride of about 63°C. During boiling at reflux, gas comprising necessarily hydrogen chloride evolves from the reaction system (column 2, lines 3 and 4). The process may be operated above atmospheric pressure (column 4, line 41).

4.2.1 The Board considers, in agreement with the Examining Division, that this state of the art represents the closest one since it is directed to the preparation of precisely the same products as claim 1. The Board observes that in the present case, where the invention lies in a process for preparing known products, i.e. trisisocyanate functional derivatives of a tris-unsubstituted amino-1,3,5-triazine, the closest prior art is that document which describes said products together with a process for the preparation thereof (see decisions T 641/89, point 3.1 of the reasons; T 20/94, point 7.2 of the reasons; neither published in OJ EPO). This assessment reflects objectively the factual situation of the person skilled in the art at the effective date of the present application.

4.2.2 While conceding that document (B) could be regarded as the closest state of the art and be taken as starting point in the assessment of inventive step, the Appellant submitted that alternatively document (A) could also be considered as closest prior art. It referred to a process comprising the reaction of an amino-1,3,5-triazine with phosgene to the corresponding isocyanate functional derivative; due to the use of phosgene as reactant that process came closest to the claimed process. However, document (A) is directed to the preparation of **mono-** or **diisocyanate** functional

derivatives starting from **mono-** or **di-**unsubstituted amino-1,3,5-triazines whereas the claimed process, as well as document (B), refer to the preparation of **tris-**functional derivatives starting from **tris-**amino-1,3,5-triazines. The Board concludes therefore that document (A) represents prior art which is less promising for the skilled man to start from than document (B).

- 4.2.3 For these reasons, the Board takes document (B) as starting point when assessing inventive step.
- 4.3 In view of this state of the art, the problem underlying the present application as submitted by the Appellant consists in providing a further process for preparing at least trisisocyanate functional derivatives of (at least tris-unsubstituted amino)-1,3,5-triazines.
- 4.4 The present application proposes as the solution to this problem the process according to claim 1 (see point III above) which is essentially characterized by using phosgene as the reactant at a temperature of 51.4°C to 120°C and at a pressure of 50 psig ( $3.45 \times 10^5$  Pa) to 1000 psig ( $6.9 \times 10^6$  Pa), and by passing an inert gas through the pressurized and heated reaction system during the reaction.
- 4.5 The specification of the present application demonstrates in the sole example that the claimed process yields melamine triisocyanate, which is a trisisocyanate functional derivative of a trisamino-1,3,5-triazine, using phosgene as reactant at a temperature of 100°C and at a pressure of 175 psig ( $1.2 \times 10^6$  Pa), and when passing the inert gas argon through the pressurized and heated reaction system during the

reaction.

For these reasons, the Board is satisfied that the problem underlying the present application has been successfully solved.

4.6 Finally, it remains to be decided whether or not the proposed solution to the problem underlying the present application involves an inventive step.

4.6.1 Document (B), i.e. the closest prior art document (see point 4.2.3 above), addresses solely oxalylchloride to be used in the absence of an inert gas as reactant in the particular process for preparing at least trisisocyanate functional derivatives of an (at least tris-unsubstituted amino)-1,3,5-triazine, as the Appellant submitted at the oral proceedings before the Board. That document does not give any incentive to modify that process by substituting phosgene for oxalylchloride and passing an inert gas through the reaction system during the reaction in order to provide a further process for preparing at least trisisocyanate functional derivatives of (at least tris-unsubstituted amino)-1,3,5-triazines. Thus, document (B), on its own, does not render obvious the solution proposed by the claimed invention.

4.6.2 Document (A) is directed to a process for preparing an isocyanate functional derivative which comprises the reaction of an amino-1,3,5-triazine with phosgene as reactant, however, at a mandatory reaction temperature not below 150°C (cf. claim 1). The description of document (A) indicates at column 2, line 27 specifically that "the reaction is carried out at a temperature of at least 150°C; preferably...between

160° and 200°C". Thus, this teaching advises against performing the reaction of an amino-1,3,5-triazine with phosgene at a reaction temperature below that lower limit. Not only that explicit teaching of document (A) would be taken at its face value by the skilled person, it is also corroborated by the then state of the art acknowledged at column 1, lines 10 to 12 which previously failed in reacting amino-1,3,5-triazines with phosgene. In the light of the above, the specific lower limit of the reaction temperature of 150°C taught in document (A) for successfully achieving the reaction of phosgene with an amino-1,3,5-triazine is a purposive limit and not an arbitrary borderline.

For these reasons, the Board concludes that the person skilled in the art would have been deterred from contemplating a reaction temperature falling below the specific lower limit of 150°C indicated in document (A) when aiming at reacting successfully phosgene with an amino-1,3,5-triazine. The skilled person, hence, was discouraged from investigating that route as appearing unpromising when trying to solve the problem underlying the invention as defined in point 4.3 above. It follows that lowering the reaction temperature below the lower limit taught in that document, e.g. down to 120°C, which is indeed the solution proposed by the claimed invention, cannot be treated as obvious.

4.6.3 To summarize, the prior art does not give a hint to perform the reaction of a trisamino-1,3,5-triazine with phosgene at a reaction temperature not exceeding 120°C while passing an inert gas through the pressurized and heated reaction system during the reaction.

4.7 The Examining Division not relying on further documents

in the decision under appeal in order to challenge obviousness, the Board, being not aware of any further relevant document, is, thus, satisfied that the state of the art addressed in the proceedings does not render the claimed invention obvious.

- 4.8 For these reasons, the Board concludes that the subject-matter of claim 1, and by the same token, that of independent claim 5 referring to a process for preparing at least trisisocyanate-based derivatives comprising as the first step the process of claim 1 and that of dependent claims 2 to 4 and 6 to 8 involve an inventive step within the meaning of Articles 52(1) and 56 EPC.

5. *Remittal*

Having so decided, the Board has not, however, taken a decision on the whole matter, since substantial amendments to the description are required in order to bring it into conformity with the claims as amended. Under these circumstances the Board considers it appropriate to exercise the power conferred to it by Article 111(1) EPC to remit the case to the Examining Division for the purpose of properly adapting the description of the application to the present claims.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a patent on the basis of claims 1 to 8 as submitted during the oral proceedings and a description yet to be adapted.

The Registrar:

The Chairman:

N. Maslin

A. Nuss