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**Datasheet for the decision  
of 29 June 2011**

**Case Number:** T 0390/08 - 3.3.05

**Application Number:** 01109122.0

**Publication Number:** 1149799

**IPC:** C01B 3/40

**Language of the proceedings:** EN

**Title of invention:**

Process for the production of a hydrogen rich gas

**Patentee:**

Haldor Topsoe A/S

**Opponent:**

Johnson Matthey PLC

**Headword:**

Without hydrocarbon/TOPSOE

**Relevant legal provisions:**

EPC Art. 123(2), 83, 84

**Relevant legal provisions (EPC 1973):**

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**Keyword:**

"Clarity (yes): a composition consisting of compulsory and optional components is a "closed" composition"  
"Sufficiency of disclosure (yes): definition of "absence of by-products" (here: "without formation of" - "essentially no" - "no detectable amount of") to be interpreted in a technically meaningful manner"

**Decisions cited:**

T 0084/83, T 0202/83, T 1190/01, T 1998/07

**Catchword:**

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Case Number: T 0390/08 - 3.3.05

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.05  
of 29 June 2011

**Appellant:** Haldor Topsoe A/S  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 12 December 2007  
revoking European patent No. 1149799 pursuant  
to Article 101(2) EPC.

**Composition of the Board:**

**Chairman:** G. Rath  
**Members:** J.-M. Schwaller  
D. Prietzel-Funk

## Summary of Facts and Submissions

- I. This appeal was lodged by the patentee (hereinafter "the appellant") against the decision of the opposition division revoking European patent 1 149 799.
- II. In the contested decision, the opposition division held claim 1 of the main and first auxiliary requests then on file not to comply with the requirements of Article 84 EPC, because the feature "*the metal of said catalyst consists of one or more of Mg, Mn, Al, Zr, La, Ce, Pr or Nd*" - which explicitly excludes other metals - was in contradiction with the further feature that "*said catalyst optionally further contains alkali metals*".

The opposition division further held the main, first auxiliary and second auxiliary requests then on file not to comply with the requirement of sufficiency of disclosure (Article 100(b) together with Article 83 EPC). It argued that the feature "*without formation of hydrocarbons*", which was present in claim 1 of all these requests, did not need any interpretation, as it only bore the meaning that no hydrocarbons were formed irrespective of the method which was used to determine their presence. Thus, the skilled person should be able to obtain the desired result - a hydrogen rich gas without hydrocarbons - in a reliable way, irrespective of the method of evaluating the composition of the gas product. In the case at issue, by using the gas chromatography method for evaluating the said gas, the skilled person would not be able to perform the invention "without" formation of hydrocarbons as it could not determine unambiguously whether hydrocarbons

were formed or not. The argument that formation of trace amounts of hydrocarbons did not impede the possibility of carrying out the claimed process could not be accepted, because the aim of the patent-in-suit was explicitly to avoid concomitant formation of hydrocarbons. A further unclarity on how the process was to be conducted "without formation of hydrocarbons" arose in particular from examples 1 to 4, 12, 13, 16, 20, 21 and 41, which were defined as embodiments according to the invention, but showed formation of methane well above the detection limit of 15 ppm. So, it was not possible on the basis of the examples to determine which process conditions were necessary to produce a hydrogen rich gas without concomitant formation of hydrocarbons.

III. With its statement setting out the grounds of appeal dated 18 April 2008, the appellant submitted three amended sets of claims as main, first and second auxiliary requests, respectively, with claim 1 of the main request reading:

*"1. Process for the production of a hydrogen rich gas without formation of hydrocarbons comprising water gas shift conversion of a gas containing carbon monoxide and steam at a temperature of between 400° and 850°C in the presence of a basic metal oxide catalyst, wherein the metal of said catalyst consists of one or more of the elements Mg, Mn, Al, Zr, La, Ce, Pr and Nd, and mixtures thereof."*

The main request further included a dependent claim 8 reading:

*"8. Process according to any one of the preceding claims, wherein said catalyst further contains alkali metals."*

IV. Both parties, after having been duly summoned, declared that they would not be represented at the oral proceedings scheduled for 29 June 2011.

V. In preparation to the oral proceedings, the board expressed its provisional opinion that the wording of the above claims appeared not to fulfil the clarity requirement of Article 84 EPC.

VI. By telefax dated 22 June 2011, the appellant submitted three new sets of claims as a main request and as first and second auxiliary requests, respectively, with claim 1 of the main request reading:

*"1. Process for the production of a hydrogen rich gas without formation of hydrocarbons comprising water gas shift conversion of a gas containing carbon monoxide and steam at a temperature of between 400° and 850°C in the presence of a basic metal oxide catalyst, wherein the metal of said catalyst consists of one or more of the elements Mg, Mn, Al, Zr, La, Ce, Pr and Nd, and mixtures thereof, wherein said catalyst optionally further contains alkali metals."*

VII. By telefax dated 23 June 2011, the respondent objected to the above claim under Article 123(2) EPC.

VIII. Oral proceedings took place on 29 June 2011 in the absence of the parties.

IX. The parties' requests, as specified in writing in their letters, are established as follows:

The appellant requests that the decision under appeal be set aside and that the patent be maintained on the basis of the claims according to the main request filed on 22 June 2011, or in the alternative, on the basis of one of the set of claims according to the first or second auxiliary request, both filed on the same date.

The respondent requested that the appeal be dismissed.

## **Reasons for the Decision**

### **1. Main request - Amendments**

Claim 1 of this request results from the straightforward combination of claims 1 and 9 of the application as filed, and so it meets the requirements of Article 123(2) EPC.

The respondent argued that claim 9 as originally filed defined the catalyst as further containing alkali metals, hence any amendment to include alkali metals should not define the latter as optional but rather as a further definite component. This argument is not accepted by the board, because when a feature is included in a dependent claim, it is conventional in patent law to consider said feature as optional in

comparison to the features defining the subject-matter of the independent claim on which said feature depends.

2. Clarity

The definition of a composition as "consisting of" compulsory and optional components meets the requirements of Article 84 EPC, as such a composition defines a "closed" composition from which elements other than those mentioned are excluded (see in particular decisions T 1998/07, Reasons 2.1 and 2.2 and T 1190/01, Reasons 2.). This wording furthermore prevents contradiction between an independent claim and a dependent claim relating to a preferred embodiment including a further element not yet defined in the independent claim (see in this respect T 1998/07 Reasons 2.1).

Therefore, claim 1 meets the requirements of clarity of Article 84 EPC.

3. Sufficiency of disclosure

3.1 According to Article 83 EPC and its counterpart in Article 100b) EPC, the requirement of sufficient disclosure means that an invention shall be disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

3.2 In the case at issue, the decision to revoke the patent for lack of sufficient disclosure of the invention was exclusively based on the feature "without formation of hydrocarbons" that the opposition division held as not needing any interpretation, as it only bore the meaning



that no hydrocarbons were formed irrespective of the method which was used to determine their presence.

- 3.3 The board observes that in the absolute it is true that a layman reading claim 1 at issue would literally understand that the result of the process features claimed - namely the *"water gas shift conversion of a gas containing carbon monoxide and steam at a temperature of between 400° and 850°C in the presence of a basic metal oxide catalyst, wherein the metal of said catalyst consists of one or more of the elements Mg, Mn, Al, Zr, La, Ce, Pr and Nd, and mixtures thereof, wherein said catalyst optionally further contains alkali metals"* - would be the total absence of hydrocarbon by-products in the hydrogen-rich product gas.

However, a patent specification is not aimed at a layman, but at a skilled person with common general knowledge in the technical field concerned. Furthermore, sufficiency of disclosure of a patent is not to be assessed on the basis of the claims alone, but on the patent specification as a whole (see e.g. T 14/83, OJ 1984, 105, point 3. of the Reasons; T 202/83, point 2. of the Reasons).

- 3.4 In the present case, the patent specification (paragraph [0017]) describes the invention as the provision of *"a process for producing a hydrogen rich gas by contacting an effluent gas from a steam reforming unit with a basic metal oxide catalyst at high temperatures, preferably from 400°C to 850°C, with **significantly less hydrocarbon by-product formation than may be accomplished by contact with a conventional***

***iron-chromium high temperature shift catalyst***"

(emphasis added by the board). In paragraphs [0021] and [0022], it further explains that "*it was surprising that with catalysts comprised by basic oxides of main group metals, rare earth metals or mixtures thereof in crystalline or amorphous form, significant CO-conversion was observed while **essentially no hydrocarbons** (emphasis added) were formed, [...]. One of the most active catalysts was a catalyst comprised by magnesium oxide stabilised with alumina (catalyst B). Even at a very low steam/carbon ratio, **no detectable amount of hydrocarbons** was formed within 24 hours on stream at 650°C.*"

- 3.5 In summary, the skilled reader of the patent specification is taught that, in comparison to a conventional iron-chromium high-temperature shift catalyst, the catalysts of the alleged invention are supposed to produce a hydrogen rich gas containing "essentially no hydrocarbons", or even "no detectable amount of hydrocarbons" as regards the "most active catalysts" based on magnesium oxide stabilised with alumina.

Hence, the skilled person learns from the description of the patent specification that a broader technically meaningful interpretation is to be given to the expression "without formation of hydrocarbons" than the strict literal interpretation held by the opposition division.

The board further holds the interpretation of the opposition division that "no hydrocarbons were formed irrespective of the method which was used to determine

their presence" as not appropriate, because it is common general knowledge that any measurement method has its technical limits, in particular as regards the detection precision, and that this limit varies from one method to the other.

3.6 The contested patent (paragraph [0031]) further describes the analysis of the product gas, in particular as regards the presence of higher hydrocarbons and CH<sub>4</sub>, as having been made by gas chromatography using argon as the internal standard. The contested patent (page 5, line 7) also discloses the detection limit of the gas chromatography equipment to be 15 ppm of methane. So, there is no gap of information in the contested patent as regards the measurement method used and the skilled person is clearly and unambiguously informed how the formation of hydrocarbons is to be assessed.

3.7 The contested patent (Table 1; pages 7 to 9) further discloses numerous examples - Experiments 1 to 4, 6 to 19, 30, 32, 34 and 36 to 39, 90 (sic) and 41 - which are in conformity with a technically meaningful interpretation of claim 1 at issue and so provides a "hydrogen rich gas without formation of hydrocarbons", since the gas produced contains - depending on the catalyst used and the operating conditions - from 0 to 121 ppm methane and no higher hydrocarbons.

In comparison, the iron-chromium catalyst - considered as reference in the introductory part of the patent specification - when tested under comparable conditions was assessed to produce a hydrogen rich gas containing 290 ppm CH<sub>4</sub> (Experiment 23), i.e. more than twice as

much hydrocarbons as the worst catalyst according to the alleged invention.

In this context, and owing to the fact that the contested patent thus contains not less than 27 specific embodiments falling under the wording of claim 1 at issue and not less than 14 specific embodiments - Experiments 6 to 11, 14, 15, 17 to 19, 36, 39 and 90 -in which the gas produced was analysed to contain 0 ppm CH<sub>4</sub> and no higher hydrocarbons, the contested patent offers sufficient guidance since it describes in detail different ways of carrying out the invention claimed.

- 3.8 For the above reasons, the board holds that the invention as now claimed, interpreted in a meaningful way, is disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art pursuant to the requirements of Article 100(b) together with Article 83 EPC.
- 3.9 The arguments of the respondent were all based on the strict interpretation of the subject-matter claimed adopted by the opposition division, and for the same reasons as given above, these arguments could not convince the board.
4. As the decision to revoke the patent only dealt with the allowability of the amended claims under Articles 83, 84 and 123 EPC, and as the opposition division has not yet ruled on the outstanding issues regarding the claims of the present request, in particular novelty and inventive step, the board considers it appropriate to exercise its power

conferred by Article 111(1) EPC to remit the case to the first instance for further prosecution.

## **Order**

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

The decision under appeal is set aside.

The case is remitted to the department of first instance for further prosecution on the basis of the claims according to the main request filed on 22 June 2011.

The Registrar:

The Chairman:

C. Vodz

G. Raths