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**Datasheet for the decision
of 5 October 2006**

Case Number: T 0066/05 - 3.2.07

Application Number: 96913025.1

Publication Number: 0823944

IPC: C23C 14/34

Language of the proceedings: EN

Title of invention:
Sputtering device

Applicant:
DEPOSITION SCIENCES, INC.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 84, 123(2)

Keyword:
"Extension beyond content of application as originally filed
(main request and auxiliary requests 1 to 3 - yes; auxiliary
requests 4 and 5 - no)"
"Clarity of claims (auxiliary requests 4 and 5 - no)"

Decisions cited:
T 0284/94, T 0770/90, T 0960/98

Catchword:
-



Case Number: T 0066/05 - 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 5 October 2006

Appellant: DEPOSITION SCIENCES, INC.
386 Tesconi Court
Santa Rosa
California 95401 (US)

Representative: Ruuskanen, Juha-Pekka
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 26 August 2004
refusing European application No. 96913025.1
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: H. Meinders
Members: H. Hahn
E. Lachacinski

Summary of Facts and Submissions

- I. The applicant lodged an appeal against the decision of the Examining Division to refuse the European patent application No. 96 913 025.1.

The Examining Division held that the subject-matter of claims 1 and 15 of the only request as filed with letter dated 16 June 2004 lacked clarity. Furthermore, according to an *obiter dictum* the subject-matter of claims 1 and 15 was considered to lack an inventive step in view of the closest prior art D1 (WO-A-95 00677) and the common general knowledge as represented by document D3 (Handbook of Plasma Processing Technology, "Reactive Sputter Deposition", W. D. Westwood, pages 233 and 235-236, Eds. S. M. Rossnagel et al, Noyes Publications, NJ, USA, 1989).

- II. With a communication dated 12 June 2006 accompanying the summons to oral proceedings to be held on 5 October 2006, the Board presented its preliminary opinion with respect to claims 1 and 15 of the main request, and claims 1 and 15 or claims 1 and 14 of the first to fifth auxiliary request, respectively, all requests as filed together with the grounds of appeal dated 23 December 2004. None of the six requests appeared to comply with Articles 123(2) and 84 EPC. The Board stated that an apparatus claim 1 without the objectionable amendment to "automatic feedback control means" appeared to lack novelty with respect to the apparatus disclosed in D1. The Board further remarked that, provided that a request were to be considered to meet the requirements of Articles 123(2) and 84 EPC, the issues of novelty and inventive step would be dealt

with in the oral proceedings starting from the closest prior art D1 taking account of the technical problem to be solved.

- III. With fax of 5 September 2006 the appellant filed amended first to fifth auxiliary requests together with arguments and repeated its request for oral proceedings in case that none of its requests would be considered to be allowable.
- IV. Oral proceedings before the Board were held on 5 October 2006.

The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the claims of the main request as filed together with the grounds of appeal dated 23 December 2004 except that the term "monitored" was deleted from dependent claim 5, or alternatively that a patent be granted on the basis of one of the auxiliary requests 1 to 5 as submitted during the oral proceedings before the Board.

- V. Independent claims 1 and 15 according to the main request read as follows:

"1. A sputter coating system comprising:
a vacuum chamber having a coating station;
substrate mounting and moving means (61) adapted for passing one or more substrates (60) to be coated by said coating station;
means (70,72) for introducing a reactive gas (71) into said vacuum chamber at a predetermined rate;
a target (66) operating at a predetermined power level sufficient to create a reactive atmosphere adjacent to

said coating station and to plasma sputter a selected material onto substrates when passed by said coating station by said substrate mounting and moving means; and

a plasma generator (67) operating at a predetermined power level for increasing the area, density and reactivity of the reactive atmosphere (68) adjacent to said coating station, said predetermined power level being selected such that the reactive atmosphere collectively produced by said target and said plasma generator converts substantially all of the sputtered material into a different chemical species without poisoning said target, **characterized**

(1) in that said plasma generator (67) is adapted to operate at a power level at which (a) partial pressure of the reactive gas required to convert substantially all of the material sputtered onto the substrates into a different chemical species is below (b) the partial pressure of the reactive gas required for substantially poisoning the target such that there is a range of reactive gas partial pressures between (a) the partial pressure of the reactive gas required to convert substantially all of the material sputtered onto the substrates into a different chemical species and (b) the partial pressure of the reactive gas required for substantially poisoning the target over which the change in partial pressure varies sufficiently slowly as a function of the rate of introduction of the reactive gas such that it is feasible to monitor the reactive gas partial pressure and to effect control of the partial gas reactive pressure [*sic!* should read: reactive gas partial pressure] within a predetermined range by feedback control means; and

(2) by automatic feedback control means (69,70) for monitoring and actively maintaining the partial pressure of the reactive gas in the predetermined range of the reactive gas partial pressures."

"15. A method in a sputter coating system comprising:
a vacuum chamber having a coating station;
substrate mounting and moving means (61) adapted for passing one or more substrates (60) to be coated by said coating station;
means (70,72) for introducing a reactive gas (71) into said vacuum chamber at a predetermined rate;
a target (66) operating at a predetermined power level sufficient to create a reactive atmosphere (68) adjacent to said coating station and to plasma sputter a selected material onto substrates when passed by said coating station by said substrate mounting and moving means; and
a plasma generator (67) operating at a predetermined power level for increasing the area, density and reactivity of the reactive atmosphere adjacent to said coating station, said predetermined power level being selected such that the reactive atmosphere collectively produced by said target and said plasma generator converts substantially all of the sputtered material into a different chemical species without poisoning said target, **characterized by** the steps of:
(1) operating the plasma generator (67) at a power level at which (a) partial pressure of the reactive gas required to convert substantially all of the material sputtered onto the substrates into a different chemical species is below
(b) the partial pressure of the reactive gas required for substantially poisoning the target such that there

is a range of reactive gas partial pressures between (a) the partial pressure of the reactive gas required to convert substantially all of the material sputtered onto the substrates into a different chemical species and (b) the partial pressure of the reactive gas required for substantially poisoning the target over which the change in partial pressure varies sufficiently slowly as a function of the rate of introduction of the reactive gas such that it is feasible to monitor the reactive gas partial pressure and to effect control of the partial gas reactive pressure [*sic!* should read: reactive gas partial pressure] within a predetermined range by feedback control means;

(2) monitoring the partial pressure of the reactive gas; and

(3) automatically controlling the partial pressure of the reactive gas by actively controlling the rate of introduction of reactive gas into the chamber to maintain the partial pressure of the reactive gas in the predetermined range of the reactive gas partial pressures."

VI. Claim 1 according to auxiliary request 1 reads as follows:

"1. A sputter coating system comprising:
a vacuum chamber having a coating station;
substrate mounting and moving means (61) adapted for passing one or more substrates (60) to be coated by said coating station, the dimension of the coating station transverse to the movement of the mounting and moving means exceeding the width of the one or more substrates;

means (70,72) for introducing a reactive gas (71) into said vacuum chamber;

an elongated magnetron sputter target (66) operating at a predetermined power level sufficient to create a reactive atmosphere adjacent to said coating station and to plasma sputter a selected material onto substrates when passed by said coating station by said substrate mounting and moving means; and

an elongated plasma generator (67) adjacent said target for increasing the area, density and reactivity of the reactive atmosphere (68) adjacent to said coating station such that the reactive atmosphere collectively produced by said target and said plasma generator converts the sputtered material into a different chemical species without poisoning said target,

characterized

in that said plasma generator (67) is adapted to operate at a predetermined power level at which the partial pressure of the reactive gas is within a partial pressure range between a partial pressure that is less than a poisoning pressure (26) and a partial pressure (24) required for complete reaction of the sputtered material, and

by feedback control means comprising a sensor (69) for sensing the partial pressure and a flow controller (70) responsive to the sensor for actively maintaining the partial pressure of the reactive gas in the region of a partial pressure (25) which is higher than the partial pressure (24) at which the complete reaction of the sputtered material occurs and which belongs to a pressure domain in which the partial pressure varies slowly as a function of the rate of introduction of the reactive gas so that it is relatively easy to effect

control of the introduction and partial pressure of the reactive gas by the feedback control means (69,70)."

VII. Claim 1 according to auxiliary request 2 reads as follows:

"1. A sputter coating system comprising:
a vacuum chamber having a coating station;
substrate mounting and moving means (61) adapted for passing one or more substrates (60) to be coated by said coating station, the dimension of the coating station transverse to the movement of the mounting and moving means exceeding the width of the one or more substrates;
means (70,72) for introducing a reactive gas (71) into said vacuum chamber;
an elongated magnetron sputter target (66) operating at a predetermined power level sufficient to create a reactive atmosphere adjacent to said coating station and to plasma sputter a selected material onto substrates when passed by said coating station by said substrate mounting and moving means; and
an elongated plasma generator (67) adjacent said target for increasing the area, density and reactivity of the reactive atmosphere (68) adjacent to said coating station such that the reactive atmosphere collectively produced by said target and said plasma generator converts the sputtered material into a different chemical species without poisoning said target,
characterized
in that said plasma generator (67) is adapted to operate at a predetermined power level at which the partial pressure of the reactive gas is within a partial pressure range between a partial pressure that

is less than a poisoning pressure (26) and a partial pressure (24) required for complete reaction of the sputtered material, and by feedback control means comprising a sensor (69) for sensing a parameter that is dependent on the partial pressure and a flow controller (70) responsive to the sensor for actively maintaining the partial pressure of the reactive gas in the region of a partial pressure (25) which is higher than the partial pressure (24) at which the complete reaction of the sputtered material occurs and which belongs to a pressure domain in which the partial pressure varies slowly as a function of the rate of introduction of the reactive gas so that it is relatively easy to effect control of the introduction and partial pressure of the reactive gas by the feedback control means (69,70)."

VIII. Claim 1 according to auxiliary request 3 reads as follows:

"1. A sputter coating system comprising:
a vacuum chamber having a coating station;
substrate mounting and moving means (61) adapted for passing one or more substrates (60) to be coated by said coating station, the dimension of the coating station transverse to the movement of the mounting and moving means exceeding the width of the one or more substrates;
means (70,72) for introducing a reactive gas (71) into said vacuum chamber;
an elongated magnetron sputter target (66) operating at a predetermined power level sufficient to create a reactive atmosphere adjacent to said coating station and to plasma sputter a selected material onto

substrates when passed by said coating station by said substrate mounting and moving means; and an elongated plasma generator (67) adjacent said elongated magnetron sputter target for increasing the area, density and reactivity of the reactive atmosphere (68) adjacent to said coating station such that the reactive atmosphere collectively produced by said target and said plasma generator converts the sputtered material into a different chemical species without poisoning said target, **characterized** in that said plasma generator (67) is adapted to operate at a predetermined power level at which the partial pressure of the reactive gas is within a partial pressure range between a partial pressure that is less than a poisoning pressure (26) and a partial pressure (24) required for complete reaction of the sputtered material, and by feedback control means comprising a sensor (69) for sensing the partial pressure and a flow controller (70) responsive to the sensor for actively maintaining the partial pressure of the reactive gas in the region of a partial pressure (25) which is higher than the partial pressure (24) at which the complete reaction of the sputtered material occurs and which belongs to a pressure domain in which the partial pressure varies slowly as a function of the rate of introduction of the reactive gas so that it is relatively easy to effect control of the introduction and partial pressure of the reactive gas by the feedback control means (69,70), wherein substantially all of said selected material that is coated onto said substrates is converted to said different chemical species during a single pass of said substrates (60) by said coating station."

IX. Claim 1 according to auxiliary request 4 reads as follows:

"1. A sputter coating system comprising:
a vacuum chamber having a coating station;
substrate mounting and moving means (61) adapted for passing one or more substrates (60) to be coated by said coating station, the dimension of the coating station transverse to the movement of the mounting and moving means exceeding the width of the one or more substrates;
means (70,72) for introducing a reactive gas (71) into said vacuum chamber;
an elongated magnetron sputter target (66) operating at a predetermined power level sufficient to create a reactive atmosphere adjacent to said coating station and to plasma sputter a selected material onto substrates when passed by said coating station by said substrate mounting and moving means; and
an elongated plasma generator (67) adjacent said target for increasing the area, density and reactivity of the reactive atmosphere (68) adjacent to said coating station such that the reactive atmosphere collectively produced by said target and said plasma generator converts the sputtered material into a different chemical species without poisoning said target,
characterized
in that said elongated plasma generator (67) is placed close adjacent said elongated magnetron sputter target (66) for allowing distribution of continuous plasma in the vicinity of the elongated magnetron sputter target by ambipolar diffusion in the presence of local magnetic fields created by magnets within the elongated plasma generator or magnetron sputter target without

generation of an additional magnetic field by external magnets,
in that the elongated plasma generator (67) is adapted to operate at a predetermined power level at which the partial pressure of the reactive gas is within a partial pressure range between a partial pressure that is less than a poisoning pressure (26) and a partial pressure (24) required for complete reaction of the sputtered material, and
by feedback control means comprising a sensor (69) for sensing the partial pressure and a flow controller (70) responsive to the sensor for maintaining the partial pressure of the reactive gas in the region of a partial pressure (25) which is higher than the partial pressure (24) at which the complete reaction of the sputtered material occurs and which belongs to a pressure domain in which the partial pressure varies slowly as a function of the rate of introduction of the reactive gas so that it is relatively easy to effect control of the introduction and partial pressure of the reactive gas by the feedback control means (69,70)."

- X. Claim 1 according to auxiliary request 5 differs from that of claim 1 according to auxiliary request 4 in that the characterising portion reads as follows:

"in that said elongated plasma generator (67) is placed so close adjacent said elongated magnetron sputter target (66) that the substrate and elongated magnetron target can be placed close to one another and no additional chamber volume is required and that distribution of continuous plasma is allowed in the vicinity of the elongated magnetron sputter target by ambipolar diffusion in the presence of local magnetic

fields created by magnets within the elongated plasma generator or magnetron sputter target without generation of an additional magnetic field by external magnets,

in that the elongated plasma generator (67) is adapted to operate at a predetermined power level at which the partial pressure of the reactive gas is within a partial pressure range between a partial pressure that is less than a poisoning pressure (26) and a partial pressure (24) required for complete reaction of the sputtered material, and

by control means comprising a sensor (69) for sensing the partial pressure and a flow controller (70) responsive to the sensor for maintaining the partial pressure of the reactive gas in the region of a partial pressure (25) which is higher than the partial pressure (24) at which the complete reaction of the sputtered material occurs and which belongs to a pressure domain in which the partial pressure varies slowly as a function of the rate of introduction of the reactive gas so that it is relatively easy to effect control of the introduction and partial pressure of the reactive gas by the control means (69,70), wherein said selected material that is coated onto said substrates is converted to said different chemical species during a single pass of said substrates (60) by said coating station."

- XI. Independent process claims 15 or 14 of auxiliary requests 1 to 5, respectively, contain features - similar to process claim 15 of the main request - corresponding to the apparatus features of claim 1 of each respective request.

XII. The appellant argued essentially as follows:

The amendments made to claim 1 of the main request are based on claims 1 and 5 in combination with figure 5 and page 11, lines 1 to 4, page 13, lines 15 to 18, page 15, lines 2 to 5, page 16, line 29 to page 17, line 7, page 18, lines 28 to 31 and page 27, lines 8 to 11 of the application as originally filed (corresponding to WO-A-96 34125). In this context the restriction comprised in claim 1 as originally filed to "magnetron" sputter systems has been deleted as it is clear from e.g. page 1, lines 12 and 13 or page 2, lines 10 to 14 that this feature does not represent an essential feature. Furthermore, it is admitted that the terms "automatic" or "feedback" are not explicitly mentioned in the specification as filed. However, from the example of figure 6 it is unambiguous to the skilled person that the arrow ended line connecting the pressure sensor 69 and the flow controller 70 implies that the flow of gas into the chamber is controlled in response to monitoring of the pressure within said chamber by said pressure sensor, whereby the control means can maintain the partial pressure at the defined level within said chamber. Thus the skilled person immediately recognises that said control system of figure 6 operates as a closed loop without intervention from a human operator, and that the control of the pressure by the flow controller 70 is based on a feedback signal generated by the monitoring element, i.e. sensor 69. Since said closed loop is a direct closed loop this feedback control must be automatic.

Furthermore, at page 17, second paragraph the "delay of response" is mentioned which prompts to think of an

automatic control system. It would also not be fair to limit the applicant to the specific embodiment of figure 6. The term "monitoring" of the pressure, rather than sensing it, is used to reflect the fact that in addition to the pressure sensor 69 of figure 6 other possibilities of monitoring the pressure are disclosed (see page 17, lines 17 to 21). Further, this term is a more appropriate term for covering said alternatives than the term sensing would be.

The term "actively" contained in claims 1 of the main request and auxiliary requests 1 to 3 corresponds to a response to a measured partial pressure value.

The terms "substantially" and "sufficiently" contained in claim 1 of the main request may be derived from the specification, particularly when considering that it is clear to the skilled person that the target will be poisoned to some extent but not to such an extent which would limit the process. Likewise it is clear that not all of the sputtered material is converted into said different chemical species. Thus the conclusion of point 2.4 of decision T 770/90 cited by the Board in the annex to the summons does not apply in the present case.

The specific configuration of the sputter target, the plasma generator and the substrate to be in "close proximity" or "adjacent" does not represent an essential feature as e.g. figure 6 does not show such close proximity of these elements. The term "adjacent" does not mean "next to" but means only "close to" (compare figure 6). Furthermore, the substrates do not form part of the machine and implicitly must be present

when the apparatus is used. Furthermore, this feature makes no difference to the scope of claim 1. The same is valid with respect to the non-required additional chamber volume and the external magnets as described at page 10, last paragraph of the application as originally filed.

Although the diagram of figure 2 is incorrect with respect to what happens at partial pressures above the partial pressure of point 26 - it should actually look like a curve going first up to the left side and then back up to the right side - the skilled person taking account of this diagram can determine whether or not he is "in the region of point 25" since this point 25 is between points 24 and 26 and defines a domain around it.

Therefore the claims 1 of the main and of the auxiliary requests 1 to 5 meet the requirements of Articles 84 and 123(2) EPC.

Reasons for the Decision

1. Admissibility of amendments (Article 123(2) EPC)

Main request

- 1.1 Claim 1 of the main request contains the feature "(2) by **automatic** feedback control **means** (69,70) **for monitoring** and **actively maintaining** the partial pressure of the reactive gas in the predetermined range of the reactive gas partial pressures" which has no explicit basis in the application as originally filed

(WO-A-96 34125) as admitted by the appellant during the oral proceedings.

1.2 WO-A-96 34125 discloses only generally that "a flow control system is used to maintain the flow at a level that maintains the flow and pressure at a point in the region of point 25" (see page 16, lines 30 to 33), that "a control system maintains the partial pressure of reactive gas at a level that is less than the poisoning pressure and greater than the pressure for complete reaction" (see page 25, lines 24 to 28; also page 13, lines 12 to 18), that "a pressure control system, not shown, regulates the partial pressure ... within the chamber" (see page 26, lines 10 to 12) or that "a suitable control system, not shown, maintains the partial pressure of oxygen ..." (see page 27, lines 8 to 11). Only in the context of figure 6 does WO-A-96 34125 disclose specifically that "the control system, comprises, in part, the pressure sensor 69 and the flow controller 70" and that the flow of reactive gas 71 "is governed by the flow controller" (see page 25, lines 28 to 30). WO-A-96 34125 further discloses that "the partial pressure is the variable that must be controlled during the process, control may be achieved by sensing other parameters that vary smoothly with the pressure. Intensity of spectral lines of species within the plasma may be used. Still another technique is to control the flow based on variations in the target voltage" (see page 17, lines 17 to 21).

1.3 The appellant's arguments that the skilled person when reading the specification, would directly and unambiguously derive "automatic feedback control means" which allow "monitoring" and "actively" maintaining the

partial pressure cannot be accepted for the following reasons.

- 1.3.1 Although the skilled person would immediately recognise that the pressure control system shown in figure 6 operates as a closed loop, and that the control of the pressure by the flow controller 70 is based on a feedback signal generated by sensor 69, i.e. a sensing element, there is no hint in WO-A-96 34125 that such control shall be carried out by automatic means without the intervention from a human operator. Figure 6 represents only a schematic drawing which does not show any automatic means and the corresponding description is also silent with respect to automatic means or that this closed loop is a direct closed loop (compare paragraph 1.2 above).

Furthermore, the "delay of response" mentioned at page 17, second paragraph, of WO-A-96 34125 neither prompts to think of an automatic control system since this passage only describes that a change of gas flow needs some time to result in a change of the partial pressure, which change, however, is dependent upon the pump speed and the chamber volume. Hence said delay of response does not necessarily imply any automatic control means.

- 1.3.2 Likewise, no basis could be found in WO-A-96 34125 that said disclosed control means "**actively**" maintains said partial pressure in the predetermined range.

In the Board's view this term corresponds to an "**automatic** feedback control means" and attempts to define a direct closed loop control system.

Consequently, the definition of "**actively** maintaining the partial pressure" - which is considered to imply an immediate reaction to a change of the partial pressure - does not correspond to a simple "response" to a measured partial pressure value as argued by the appellant, since such a "response" can take place sometime later.

- 1.3.3 Additionally, the WO-A-96 34125 only discloses "**controlling** of the partial pressure" which from the Board's view does not imply any "**monitoring**" of the partial pressure. The term "monitoring" implies that the pressure is measured at predetermined time intervals or continuously during the process for which no basis could be found in WO-A-96 34125. Even if the term "controlling" were to imply "monitoring" then there would not exist any need to additionally incorporate said further definition in the claim.
- 1.3.4 Furthermore, the replacement of a specific apparatus feature such as the disclosed "control system" and particularly the more specific embodiment according to figure 6 including a pressure sensor 69 and a flow controller 70" by an "**automatic feedback control means (69,70) for monitoring and actively maintaining** the partial pressure of the reactive gas", i.e. replacement by a functional means definition, extends the subject-matter beyond the content of the application as originally filed since the result would be that there exist other specific - undisclosed - alternatives which fulfil this function (see Case Law of the Boards of Appeal of the European Patent Office, 4th edition, 2001, chapter III.A.1.1, see also T 284/94, OJ EPO, 1999, 464).

- 1.4 Also the expressions "substantially" and "sufficiently" in the features "to **convert substantially** all of the material sputtered", "below the partial pressure of the reactive gas required for **substantially poisoning** the target", "to **convert substantially** all of the material sputtered", "the change in partial pressure **varies sufficiently slowly**", "**such that it is feasible to monitor** the reactive gas partial pressure" of claim 1 of the main request could not be found in the description of WO-A-96 34125.

The feature "without substantially poisoning said planar magnetron sputtering target" was contained only in claims 1, 12 and 16 of WO-A-96 34125 while the feature "substantially completely converted to said different chemical species" was only contained in claims 3 and 13 as originally filed. Since the description of WO-A-96 34125 does not contain any counterpart for these features, which compared to the disclosure in the description have been broadened by the term "substantially" (compare e.g. page 13, lines 19 to 24; page 15, lines 2 to 5; page 16, lines 29 to 35; page 18, line 32 to page 19, line 1; page 24, lines 30 to 32; page 25, lines 24 to 28), these features are not supported by the description as required by Article 84 EPC and therefore said originally filed claims cannot serve as a basis for further amendments (compare decision T 770/90, unpublished in OJ EPO, points 2.1 to 2.4).

- 1.5 In this context the Board points out that the Examining Division in its summons for oral proceedings made the remark "It is noted that the new feature in claim 1

"automatic feedback control means (69,70) for monitoring" appears to be based on a generalisation of the feature found in the paragraph bridging pages 25 and 26, namely a "pressure sensor 69", which implies monitoring" (compare summons to oral proceedings dated 26 March 2004, point 3).

However, although the issue of Article 123(2) EPC had been discussed during the oral proceedings before the first instance - as apparent from the minutes thereof - the impugned decision is silent with respect to the issue of Article 123(2) EPC and thus deficient in this respect.

- 1.6 Taking account of paragraphs 1.1 to 1.4 above it is, however, evident that claim 1 of the main request contravenes Article 123(2) EPC. The same conclusion applies to process claim 15 of the main request which contains the corresponding objectionable features of claim 1.

The main request is thus not allowable.

Auxiliary requests 1 to 3

- 1.7 Claims 1 according to auxiliary requests 1 to 3 contain the identical features "feedback control means comprising a sensor (69)" and "a flow controller (70) responsive to the sensor for **actively** maintaining the partial pressure in the region of partial pressure (25)" as claim 1 of the main request.

Independent process claims 15 or 14 according to auxiliary requests 1 to 3, respectively, contain the

identical feature "**actively** controlling ..." as claim 15 of the main request.

- 1.8 Hence the conclusions with respect to claims 1 and 15 of the main request (see paragraphs 1.3.2 and 1.6 above) apply *mutatis mutandis*.

The Board therefore concludes that claims 1 and 15 of auxiliary requests 1 and 2 or claims 1 and 14 of auxiliary request 3, respectively, contravene Article 123(2) EPC. The auxiliary requests 1 to 3 are therefore not allowable.

Auxiliary requests 4 and 5

- 1.9 Claims 1 of auxiliary requests 4 and 5 are based on originally filed claims 1 and 5 and the remaining features can be derived from page 2, lines 10 to 15; page 10, lines 14 to 19 and lines 22 to 33; page 13, lines 7 to 11; page 14, line 28 to page 15, line 1; page 15, lines 20 to 27; page 16, line 29 to page 17, line 2; page 25, lines 24 to 29 and page 28, lines 20 to 26 of the description of the application as originally filed.

- 1.10 Likewise independent process claims 15 and 14 of auxiliary requests 4 and 5, respectively, are based on originally filed claims 12 and 15 while the remaining features can be derived from page 2, lines 10 to 15; page 10, lines 14 to 19 and lines 22 to 33; page 13, lines 7 to 11; page 14, line 28 to page 15, line 1; page 15, lines 20 to 27; page 16, line 29 to page 17, line 2; page 25, lines 24 to 29 and page 28, lines 20

to 26 of the description of the application as originally filed.

1.11 Hence independent claims 1 and 15 and claims 1 and 14 of auxiliary requests 4 and 5, respectively, are considered to meet the requirements of Article 123(2) EPC.

2. *Clarity (Article 84 EPC)*

Auxiliary request 4

2.1 Claims 1 and 15 of auxiliary request 4 contain the feature "**a pressure domain in which the partial pressure varies slowly as a function of the rate of introduction of the reactive gas so that it is relatively easy to effect control of the introduction and partial pressure of the reactive gas by the feedback control means** (69,70)" which renders the claims 1 and 15 unclear.

The application does not contain any information as to what is to be understood by the relative term "**varies slowly ... so that it is relatively easy to effect control ... by the feedback control means**". There exists only one basis for this term in the description (see page 16, line 33 to page 17, line 2) which, however, does not enable the skilled person to determine whether the pressure changes "slowly enough" or "too fast", particularly since this variation in pressure is dependent upon the chamber volume (see page 17, lines 8 to 16). The dimensions of the specific apparatus used for examples 1 to 4, however, are not given. Furthermore, it is not mentioned which control means or

feedback control means **are** suitable for this purpose and should therefore be used by the skilled person, so that as a result it would then be "relatively easy to effect the control" of the gas flow and thereby to control the partial pressure of the reactive gas, or which means **are not** suitable.

- 2.2 In this context it has also to be considered that the skilled person is already left in the dark as to how he should quantitatively determine point 24, i.e. the partial pressure at which full conversion of the sputtered species takes place as alleged, and as to how he should quantitatively determine point 26, i.e. the higher partial pressure of the poisoning threshold, since the application as filed is also silent in this respect, particularly when considering that the claims encompass all kinds of reactive gases and that the description is also silent in this respect. The said pressure domain which "**varies slowly ... so that it is relatively easy to effect control** ... by the feedback control means" contains, according to figure 2, a point 25 on a curve somewhere between these two points 24 and 26. A small change in the flow rate can result in a steep increase of the partial pressure. However, the slope of this curve between points 24 and 26 is not described and the schematic diagram of figure 2 is also not helpful in this respect. Consequently, the skilled person does not know which variation would still be acceptable and which one would not.

- 2.3 Taking account of the above considerations the Board holds that the range limits as defined in claims 1 and 15 leave the scope of the claimed invention unclear, contrary to Article 84 EPC, since the skilled person is

not put in a position to determine whether or not he is working within the forbidden area of the claims (see T 960/98, unpublished in OJ EPO, point 3.8.3 of the reasons).

Auxiliary request 4 is therefore not allowable.

- 2.4 In this context the Board remarks that a similar clarity objection had already been raised by the Examining Division with respect to a similar relative term in process claim 15 (see the impugned decision, point 3 of the reasons).

Auxiliary request 5

- 2.5 Independent claims 1 and 14 of auxiliary request 5 contain the identical feature as claims 1 and 15 of auxiliary request 4 except that the "relatively easy control" is effected more generally by "control means".

This does not, however, alter the fact that the conclusions with respect to claims 1 and 15 of auxiliary request 4 (see paragraphs 2.1 to 2.3 above) apply *mutatis mutandis*.

The Board therefore concludes that claims 1 and 14 of auxiliary request 5 contravene Article 84 EPC.

Auxiliary request 5 is therefore not allowable, too.

3. Consequently, none of the appellant's requests is allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

G. Nachtigall

H. Meinders