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D E C I S I O N
of 18 December 1995

Case Number: T 0850/93 - 3.4.1

Application Number: 87302788.2

Publication Number: 0240309

IPC: H01L 21/20

Language of the proceedings: EN

Title of invention:
Method for forming crystal and crystal article obtained by said method

Applicant:
CANON KABUSHIKI KAISHA

Opponent:
-

Headword:
Single crystal growth/CANON I

Relevant legal provisions:
EPC Art. 56

Keyword:
"No enabling disclosure in prior document - novelty (yes)"
"Inventive step (yes; after amendment)"

Decisions cited:
T 0206/83, T 0081/87

Catchword:
-

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Case Number: T 0850/93 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 18 December 1995

Appellant: CANON KABUSHIKI KAISHA
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Tokyo (JP)

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Decision under appeal: **Decision of the Examining Division of the European Patent Office dated 6 May 1993 refusing European patent application No. 87 302 788.2 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: G. D. Paterson
Members: H. J. Reich
R. K. Shukla

Summary of Facts and Submissions

I. European patent application No. 87 302 788.2 (publication No. 0 240 309) was refused by a decision of the Examining Division.

II. The reason given for the refusal was that the subject-matter of Claims 1 of the main, first and second auxiliary requests filed on 2 March 1993 does not meet the requirements of Articles 52(1) and 56 EPC having regard to documents:

D1: Solid State Technology, vol. 27, No. 9, September 1984, pages 239 to 243;

D5: US-A-3 620 833; and

D8: Philips Technical Review, vol. 41, No. 2, 1983/84, pages 60 to 69.

The reasons for the refusal can be summarised as follows:

(a) In respect of Claim 1 of each of the main and first auxiliary requests, document D5 is the most relevant prior art. In particular, a skilled person would derive from document D5, Figures 3 to 4 and column 2, lines 33 to 36, that under selected conditions of deposition a relatively small size of the nucleation sites (formed by imprinting a nucleating agent on a SiO_2 surface or by making indentations or by selective damage of the SiO_2 layer) supports the formation and growth of a single nucleus only, since otherwise two or more crystals or no crystals at all would have developed on at least some of the nucleation sites which have a larger nucleation density than the remainder of the SiO_2 layer. Document D8, in particular

Figure 10 and page 64, right column, last paragraph discloses that the nucleation density of Si is much greater on Si_3N_4 than on SiO_2 and that this difference increases with lower deposition temperatures. This teaching in document D8 is a clear incentive to the skilled person to use Si_3N_4 as a nucleating agent on SiO_2 in the method disclosed in document D5. In such use a skilled person can either provide (a) a patterned Si_3N_4 layer (spots) on SiO_2 or (b) a patterned SiO_2-layer forming windows on Si_3N_4. Since a combination of SiO_2 and Si_3N_4 layers is generally known from the well-established LOCOS technique, selection of alternative (b) and arriving thereby at the subject-mater of Claim 1 of the main request does not demand inventive action from the skilled person.

Claim 1 of the first auxiliary request specifies that the nucleating agent (i.e. the material of the deposition surface areas) is amorphous. Since Si_3N_4 deposits are normally amorphous, also the subject-matter of Claim 1 of the first auxiliary request is obvious in view of documents D5 and D8.

(b) With regard to Claim 1 of the second auxiliary request, document D1 is considered to be the most relevant prior art. Claim 1 of this request differs from the disclosure in document D1 in that the deposition surface areas exposed through windows in a SiO_2 layer are of polycrystalline silicon rather than of monocrystalline silicon. It would be obvious to a skilled person to replace the monocrystalline silicon substrate in the method according to document D1 by a polycrystalline one, if the circumstances require this and to select the

window size so that at the most one complete single crystalline grain of the polycrystalline substrate is exposed.

III. The Appellant lodged an appeal against this decision. In the Statement of Grounds of Appeal the Appellant filed a new main request based on a set of claims containing a main Claim 1 which is based on Claims 1 and 2 of his former main request, and four auxiliary requests. Furthermore, he requested oral proceedings as an auxiliary request. In support of his arguments the Appellant filed the following documents:

D9: Applied Physics Letters, vol. 52, No. 15, 1988, pages 1231 to 1233;
D10: Applied Physics Letters, vol. 55, No. 7, 1989, pages 636 to 638;
D11: Applied Physics Letters, vol. 55, No. 11, 1989, pages 1071 to 1073;
D12: Applied Surface Science, vol. 41/42, 1989, pages 638 to 642.

IV. In a communication pursuant to Article 110(2) EPC dated 5 December 1994 the Board informed the Appellant of its provisional view that Claim 1 of the Appellant's main request may be regarded as obvious in view of the two embodiments disclosed in document D5, column 2, lines 10 to 36 and column 3, lines 37 to 46 respectively. On the basis of the Appellant's submissions explaining the gist of the present invention, the Board proposed amendments to Claim 1 of the main request in order to overcome the objection under Article 56 EPC. In particular a more specific definition was suggested in Claim 1 of the materials of the deposition area surface, and of the deposited material which may epitaxially grow on the

former. Amendments were also suggested with a view to meeting objections under Articles 84 and 123(2) EPC and Rules 29(1) and 27(1)(b) and (c) EPC.

V. In reply to the Board's communication the Appellant filed on 10 February 1995 an amended main request and cited the following document

D13: Charles Kittel: "Introduction to Solid State Physics" 3rd edition, 1967, John Wiley and Sons Inc. New York) pages 609 and 610.

Following a telephone consultation between the Rapporteur and the Appellant's representative on 30 June 1995 wherein further amendments were discussed, the Appellant now requests that a patent be granted on the basis of the following main request:

Claims: Claim 1 according to claim pages 53 to 55 filed on 10 February 1995;
Claims 2 to 32 according to:
claim pages 55 (renumbered into 55a), 58, 60 and 62 as approved on 10 February 1995; and
claim pages 56, 57, 59, 61, 63 to 66 filed on 15 September 1993.

Description: Pages 1 to 7 filed on 10 February 1995 with the amendment on page 7 requested on 21 June 1995;
Original page 7 (renumbered into page 7a), lines 24 to 37;
Original pages 8 to 52 with the amendments on pages 8, 22, 26, 28 and 30 requested on 21 June 1995.

Drawings: Original sheet 1/15 to 15/15.

VI. Independent Claims 1, 24, 27, 28 and 29 read as follows:

"1. A method (Fig. 4; Fig. 6; Fig. 7; Fig. 9; Fig. 12) for producing on the surface of a substrate (4; 9; 10) one or more single crystals (7A; 7; 13A-1 and 13A-2) of a crystal-forming material, which method comprises:

establishing at a free surface of said substrate one or more deposition surface areas (6A; 9A; 12A-1 and 12A-2) having under chosen conditions of deposition a higher deposition rate than that of the adjacent deposition surface area or areas (5A; 11A and 11-1A), so that said crystal-forming material deposits selectively on said one or more deposition surface areas (6A; 9A; 12A-1, 12A-2), wherein the step of establishing said one or more deposition surface areas (6A; 9A; 12A-1 and 12A-2) and adjacent deposition surface area or areas (5A; 11A and 11-1A) comprises depositing a thin film (5; 11) of material which is to form said adjacent deposition surface area or areas (5A; 11A and 11-1A) onto the surface of said substrate (4; 9; 10) and opening one or more windows in said thin film by photolithographic patterning (including x-ray lithography) or by patterning with an electron beam or ion beam whereby said one or more deposition surface areas (6A; 9A; 12A-1 and 12A-2) are exposed to said crystal-forming material via said corresponding one or more windows in said adjacent deposition surface area or areas (5A; 11A and 11-1A); and

depositing said crystal-forming material on the exposed free surface (5A and 6A; 5A and 9A; 11A; 12A-1 and 12A-2) of said substrate (4; 9; 10) under said chosen conditions of deposition;
characterised in that:

(a) said one or more deposition surface areas (6A; 9A; 12A-1 and 12A-2) have surface properties which exclude an epitaxial growth of a single crystal of said crystal-forming material on said one or more deposition surface areas;

(b) the difference in deposition rates arises because the surface properties of the deposition surface area or areas and of the adjacent surface area or areas are such that a higher number of nuclei form per unit area in the deposition surface area or areas than in the adjacent surface area or areas; and

(c) the or each exposed deposition surface area or areas is limited to such a size that under said chosen conditions of deposition said crystal-forming material forms on the or each deposition surface area one single nucleus of supra-critical size which grows into one single crystal (7A; 7; 13A-1 and 13A-2).

24. An article (Fig. 4(D), Fig. 5(B), Fig. 6(D), Fig. 7(D), Fig. 8(B), Fig. 9(C), Fig. 10(B), Fig. 11, Fig. 12(D)), produced by a method as claimed in Claim 1, which article comprises:

a substrate (4) having one or more amorphous or polycrystalline regions (6A);

a thin film or layer (5) above said substrate (4); and

one or more single crystals (7A, 8) on said thin film or layer (5), which one or more single crystals (7A, 8) respectively are in contact with said one or more amorphous or polycrystalline regions (6A) via a corresponding one or more respective windows provided in said thin film or layer (5) which article does not include as thin film or layer (5) a thin film or layer of material convertible by change of crystalline state to single crystal material lattice matched to the one or more single crystals.

27. An article produced by a method as claimed in Claim 1, which article comprises:

a substrate (4);

a thin film or layer (5) above said substrate (4); and

one or more single crystals (7A, 8) on said thin film or layer (5), which one or more single crystals (7A, 8) are in contact with a respective one or more regions (6A) of said substrate (4) via a respective one or more windows provided in said thin film or layer (5); and wherein

each respective substrate region (6A) is one of the metals copper, tungsten, tantalum, molybdenum, gold, titanium, aluminium or nickel;

said thin film or layer (5) is of iron or cobalt; and

each of said single crystals (7A, 8) is of diamond.

28. An article produced by a method as claimed in Claim 1, which article comprises:

a substrate (4);

a thin film or layer (5) above said substrate (4); and

one or more single crystals (7A, 8) on said thin film or layer (5), which one or more single crystals (7A, 8) are in contact with a respective one or more

regions (6A) of said substrate (4) via a respective one or more windows provided in said thin film or layer (5); and wherein:

each respective substrate region (6A) is one of the semiconductor materials silicon, germanium, gallium arsenide, indium phosphide or silicon carbide;

said thin film or layer (5) is of iron or cobalt; and

each of said single crystals (7A, 8) is of diamond.

29. An article produced by a method as claimed in Claim 1, which article comprises:

a substrate (4);

a thin film or layer (5) above said substrate (4); and

one or more single crystals (7A, 8) on said thin film or layer (5), which one or more single crystals (7A, 8) are in contact with a respective one or more regions (6A) of said substrate (4) via a respective one or more windows provided in said thin film or layer (5); and wherein

each respective substrate region (6A) is of silicon, tungsten silicide, platinum silicide or aluminium;

said thin film or layer (5) is of silicon oxide; and

each of said single crystals (7A, 6) is of tungsten."

Claims 2 to 23 are dependent on Claim 1; and Claims 25, 26, 30, 31 and 32 are dependent on Claim 24.

VII. In support of his requests the Appellant made essentially the following submissions:

(a) The deposition of silicon through the windows in accordance with the "second embodiment" disclosed in document D5 at column 3, lines 18 to 46 does not proceed by a process that involves nucleation (i.e. the formation of fresh crystal nuclei), but instead involves the different phenomenon of continued growth of the existing crystal lattice of an existing material. The rate of growth of Si crystallites at random locations on the surface of the SiO_2 layer is moderated by etching windows through the SiO_2 which expose the underlying Si. There is then **epitaxial** growth of Si at the windows which competes with the nucleation and growth of Si on SiO_2.

(b) The disclosure at column 1, lines 50 to column 2, line 60 in document D5 is so seriously deficient that the method of making the crystallites cannot be said to have been disclosed in such a way as to enable a skilled person to carry out the claimed invention, and therefore the claimed invention was not comprised in the state of the art within the meaning of Article 54(2) EPC. In particular, printing tools or indentation tools producing nucleation sites having diameters in the length of a micron range as disclosed in document D5 (see column 2, lines 35 and 36) are not described in sufficient detail and were not common general knowledge at the date of publication of document D5 or even subsequently. In the creation of deposition sites by electron bombardment, there is no disclosure of the practical conditions required and the results achieved and deposition of a single nucleus is not to be expected (see parallel case

T 869/93). Moreover, the nucleation agents disclosed in document D5 would decompose at the silicon deposition temperatures. Crystallite regions 16 in the embodiment disclosed in Figures 8 to 13 of document D5 do **not** form **in previously defined locations**, so that actual randomly distributed locations have to be determined by scanning with a light beam and recording the resulting data in a computer (D5, column 3, lines 54 to 60).

(c) Document D5 does not teach to select the **size** of each deposition surface area in relation to the deposition conditions and the nucleation density so that only a single nucleus of crystal-forming material grows at each deposition site. The purpose of the windows in the Figures 8 to 13 embodiment of document D5 is to create sites where rapid epitaxial deposition of silicon reduces the formation of Si-crystallites on SiO_2 outside the windows. A skilled person would not consider to reduce the size of these windows since this would slow down the epitaxial deposition and increase the packing density of Si-crystallites on SiO_2.

(d) Consistent with document D13, document D8, (Figure 5 in conjunction with page 62) teaches that epitaxial growth of Si on Si takes place via surface diffusion of adsorbed atoms to a stable kink position at surface steps. At lower temperatures the diffusion of the atoms across the surface is less rapid, nucleation starts and gives rise to polycrystalline films. There is no disclosure in document D8 that a region with larger nucleation density determines the location of crystal growth. Although document D8 discloses

values for the nucleation densities of SiO_2 and Si_3N_4, the prior art does not hint at trying Si_3N_4 as nucleation site material (i.e. in the "deposition surface areas") which is surrounded by SiO_2 as non-nucleation site material (i.e. in the "adjacent deposition surface areas").

(e) The epitaxial lateral overgrowth (ELO) process disclosed in document D1 does not proceed by selective nucleation to initiate the growth of new crystals but instead proceeds by further epitaxial growth from an exposed region of an existing single crystal. Document D1 is silent about the nucleation density of exposed silicon areas and contains no disclosure that the window size is a critical feature in forming a single crystal of silicon on an insulator (SOI).

Reasons for the Decision

1. Amendments and support in the description:

1.1 The subject-matter of Claim 1 of the main request comprises the features of original Claims 1 and 32 and features disclosed in the original Figure 1 in combination with the original description as published in column 6, lines 27 to 42 and column 8, lines 49 to 57; and column 13, lines 35 to 44. The subject-matter of dependent method Claims 2 to 23 is respectively disclosed in the original application documents as follows: column 8, lines 27 to 29; column 8, lines 32 to 41; column 9, lines 24 to 30; column 16, lines 11 to 25; Claim 13; column 13, line 12 to 17; column 17, lines 33 to 41; column 8, lines 22 to 26; column 13, lines 29 to 31; column 9, lines 25 to 30; column 15, line 64 to

column 16, line 10; column 17, lines 8 to 12; column 17, lines 33 to 50; column 18, line 60 to column 19, line 10; Claim 12; Claim 16; column 11, lines 12 to 14; column 11, lines 14 to 18, Figure 10. The subject-matter of Claims 24 to 32 relating to an article can be derived from the original application documents concerning the embodiments of Figures 4 to 12; Figure 12D; column 13, lines 28 to 31, column 9, lines 22 to 30, column 17, lines 8 to 12; column 17, lines 18 to 50 in particular lines 34 and 37; column 18, line 60 to column 19, line 10; Figure 11; column 12, lines 10 to 21 and column 12 lines 25 to 29. References to the locations of original disclosure can also be derived from the Appellant's list "Basis for Amendment" as annexed to his letter dated 5 November 1991, wherein Claim 1 and 2 correspond to present Claim 1 and Claims 3 to 33 to present Claims 2 to 32.

1.2 In the Board's view, a skilled person is able to recognise that all examples for "crystal-forming material" combined with the examples for the related "deposition surface" which are disclosed in the original description of the application in suit as filed, have one property in common: That the deposition surface has properties such that the corresponding crystal-forming material does not grow epitaxially into a single crystal onto the deposition surface. Feature (a) excludes from the subject-matter of Claim 1 combinations of crystal-forming materials and related deposition surfaces wherein the deposited material grows epitaxially into a single crystal and characterises a property which is inherent to the crystal-forming material and to the related deposition surface as claimed. Therefore, amended Claim 1 including feature (a) satisfies Article 123(2) EPC. In view of the large variety of examples of material for the deposition surface and the

crystal which are disclosed in the application as filed, the amended Claim 1 including feature (a) is supported by the description in the sense of Article 84 EPC.

2. *Novelty - Method Claim 1*

2.1 Document D5 discloses a "first embodiment" in Figures 1 to 7 and column 1, line 62 to column 3, line 17 and a "second embodiment" in Figures 8 to 13 and column 3, lines 18 to 60.

As to the "first embodiment", as summarised in paragraph VII-(b) above, the Appellant has argued that document D5 does not contain an "enabling disclosure" with respect to this embodiment. For enabling the growth of one single crystal on one nucleation site, document D5 discloses means for imprinting a nucleating agent or for mechanically damaging a substrate surface with an area of a diameter "in the order of a tenth of a micron" (see D5, column 2, line 35). Means for operating in accordance with such small diameters are still not available today. Surface damage by an electron beam would not lead to a deposition of one single nucleus within one damaged area. Therefore, single crystal growth cannot reliably be obtained by the disclosed measures of the "first embodiment".

The Board has at present no reason to doubt the Appellant's submissions in this respect. In accordance with the well-established case law of the Boards of Appeal (see in particular Decisions T 206/83, OJ EPO 1987, 5, and T 81/87, OJ EPO 1990, 250), in order to destroy the novelty of a subsequently claimed invention, a prior disclosure must enable a skilled person to carry out that claimed invention. The Board is satisfied by the evidence filed by the Appellant in the present case that the disclosure of the "first embodiment" of

document D5 would not enable a skilled person to carry out the invention claimed in Claim 1 of the main request.

2.2 As to the "second embodiment" of document D5, column 3, lines 18 to 60, in particular at lines 41 to 46, this describes a method of deposition including the steps defined in the pre-characterising part of Claim 1, as accepted by the Appellant; see also the present introductory part of the description. In the Board's view, Claim 1 is novel over the "second embodiment" for the following reasons: Feature (a) is not disclosed in the "second embodiment" of document D5 for the following reason: The windows formed in accordance with, column 3, lines 18 to 46, in particular column 3, lines 41 to 46 expose as "deposition surface area" the surface of substrate 1 which consists - according to, column 2, lines 73 and 74 - of single crystalline Si and thus does not exclude an epitaxial growth of the crystal-forming material Si.

Feature (b) is not disclosed in the "second embodiment", because the deposition of the crystal-forming material (Si) on the deposition surface areas (single crystalline Si) is caused by a continuation of crystal growth on an already existing crystal surface without preceding creation of crystal nuclei and not by a surface within the window which surface allows a higher number of nuclei to be formed per unit area than the surface outside the window in the "adjacent deposition surface area".

2.3 Furthermore, a single free surface comprising two types of areas, one of which allows the formation of a higher number of nuclei per unit area than the other is also not disclosed in document D8. Figure 10 of document D8 only discloses explicit values of saturation densities

of silicon nuclei on Si_3N_4 and on SiO_2 respectively. There is no indication in document D8 to combine Si_3N_4 as "deposition surface area" with SiO_2 as "adjacent deposition surface area".

2.4 A limitation of a deposition surface area to such a size that only one single nucleus of supracritical size (remaining thereby stable) is formed within this area, is not disclosed in document D5 (see in particular column 2, lines 33 to 36, which reads "the diameters of the nucleation sites should be much smaller than the cross-sectional areas of the crystallites to be formed").

2.5 Moreover, within the windows disclosed in Figure 1 of document D1, the crystal grows epitaxially in the same way as in document D5.

2.6 The earlier filed European patent application EP-A-0 244 081 was cited under Article 54(3) EPC and does not disclose the step of "opening one or more **windows** in said thin film (of material forming the adjacent deposition surface area) ... whereby said one or more deposition surface areas are exposed to said crystal-forming material via said corresponding one or more windows ...". The deposition surface areas have the form of spot-like islands overlying the adjacent deposition surface area.

2.7 All other documents cited in the European Search Report or during the proceedings before the Examining Division are less relevant than those discussed above.

2.8 Thus in the Board's judgment, for the above reasons the subject-matter of Claim 1 is novel in the sense of Article 54 EPC.

3. *Inventive step - Method Claim 1*

3.1 In the closest prior art according to the "second embodiment" of document D5, Figure 8 to 17 and column 3, lines 18 to 46 Si crystallites 16 are randomly oriented on SiO_2 surface 4 at nucleation sites which cannot be preselected; see column 3, lines 18 to 22. Hence, starting from this closest prior art, the objective problem underlying the present invention is to provide a method for producing one or more single crystals of a crystal-forming material on a substrate which excludes an epitaxial growth mechanism of the deposited material at desired sites; see also the description, column 4 lines 62 to 65.

The above problem is solved by the combination of features (a), (b) and (c) claimed in the characterising part of Claim 1.

3.2 In the assessment of inventive step, what needs to be considered is what measures would have been obvious to a skilled person in order to grow crystallites 16 in Figure 10 of document D5 at predetermined sites. Having regard to the measures claimed for the solution of this problem, it has to be examined whether it was obvious;

(a) to localize the growth of a single crystal by fixing the site of an area, the surface of which excludes epitaxial growth, i.e. to deviate from an already existing single crystal lattice as starting point for single crystal growth and to first create a nucleus for the single crystal to be formed.

(b) to use differences in the nucleation density on a surface for fixing the site of the growth of a single crystal; i.e. to fix the desired site for a single crystal by providing at this site a surface

area where a higher number of crystal nuclei form than outside this area; and

(c) to limit the size of a nucleating surface for initiating the growth of one single crystal only; i.e. to limit the size of surface area parts with higher nucleation density such that - at chosen conditions of deposition - only one stable nucleus forms on it and grows into a single crystal.

3.3 In the "second embodiment", the epitaxial crystal growth on the single crystal Si-structure within the window does not result in the desired crystals but controls the packing density of desired crystallites which grow randomly on an insulating layer within a desired surface area. An enlargement of the window area lowers the number of randomly distributed crystallites per unit area. This disclosure does not enable a skilled person to recognise, that on a surface needing nucleation for crystal growth, such a nucleation can be initiated at defined sites by the technical means of feature (a). Furthermore, this embodiment gives no hint to combine on one substrate surface two materials with different nucleation densities, so as to increase nucleation density locally (feature (b)) and to reduce the area of increased nucleation density (i.e. the deposition surface area) so as to initiate the growth of a nucleus of supra-critical size (feature (c)).

4. As to the "first embodiment" in document D5 illustrated in Figures 1 to 7, column 2, lines 10 to 60 describes literally the working principle of the present invention, i.e. to provide small areas of enlarged nucleation density for single crystal growth. However, the Board regards it as decisive that there is insufficient information about the working concept of the claimed invention to make it obvious for a skilled person to carry out the claimed invention. The crucial text at column 2, lines 33 to 35 reads: "Desirably, the diameters of the nucleation sites should be much smaller than the cross-sectional areas of the crystallites formed". In the Board's view a skilled person sees in the above text only a desirable dimensioning of the deposition surface areas **relative** to the dimensions of the final crystal. Hence from the text describing the "first embodiment", a skilled person receives no information about the essential aspects of feature (c), i.e. that the deposition surface area **must** be so small that only "one single nucleus of supracritical size" is able to grow since otherwise no single crystal is formed. Providing the nucleation sites with their technically realisable minimum size - which following the Appellant's submission would be larger than claimed - would result in more than one stable nucleus being formed within the area of higher nucleation density, and finally the area would be covered by a polycrystalline film instead by a single crystal, so that the skilled person would be unaware of the concept of a differentiation of the nucleation density according to feature (b) for growing single crystals.

5. There is no hint in document D5 to use Si_3N_4 for a deposition surface area, but only for the dielectric material embedding the crystallites 16 formed, see column 3, lines 47 to 54. In document D8 nucleation and growth of silicon films by chemical vapour deposition

onto one and the same substrate surface is realised either on SiO_2 substrates **or** on Si_3N_4 - substrates, but never on a substrate comprising both materials SiO_2 and Si_3N_4 at the same time. The experimental results found separately for Si_3N_4 and SiO_2 as shown in Figure 10 of document D8 teach the skilled person only that the saturation density of silicon nuclei is higher on Si_3N_4 than on SiO_2. In the Board's view such experimental result does not suggest to a skilled person to provide both substances neighbouring to each other on the same substrate and to expose them simultaneously to the crystal-forming material with the view to growing single crystals of predetermined nucleation sites.

6. Document D1, in particular Figure 1 with the corresponding description describes the conventional method of Epitaxial Lateral Overgrowth. In this method a window in layer with negligibly low nucleation density exposes a single crystal surface for the continued epitaxial growth of the single crystal. Thereby a skilled person is informed that single crystal growth at a preselected site is due to the existence of a single crystal lattice structure at that site. Hence, document D1 does not teach to deviate from epitaxial growth and does therefore not even suggest feature (a).

7. For the reasons set out in paragraphs 3.1 to 3.6 above, in the Board's judgment the subject-matter of Claim 1 involves an inventive step in the sense of Article 56 EPC.

8. Thus, Claim 1 is allowable under Article 52(1) EPC. Dependent Claims 2 to 23 concern particular embodiments of the method claimed in Claim 1 and are, therefore, also allowable.

9. Independent product Claims 24, 27, 28 and 29 concern all an "article produced by a method as claimed in Claim 1". They thereby comprise structures resulting from measures (a), (b) and (c) claimed in the characterising part of Claim 1, i.e. a single crystal formed on a deposition surface exposed through a window in a film, the deposition surface having surface properties which would exclude epitaxial growth of the single crystal. Hence, the allowability of these independent product claims follows from the Board's reasoning in paragraphs 1 to 4 above. Dependent Claims 25, 26, 30, 31 and 32 concern particular embodiments of the article claimed in Claim 24 and are, therefore, also allowable.

Order

For these reasons it is decided that:

1. The decision of the Examining Division is set aside.

2. The case is remitted to the first instance with the order to grant a patent on the basis of the requested text (see paragraph V above).

The Registrar: The Chairman:

M. Beer G. D. Paterson