

The opinion in support of the decision being entered today  
is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* HICHEN M'SAAD

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Appeal 2007-1312  
Application 10/997,715  
Technology Center 1700

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Decided: June 15, 2007

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Before EDWARD C. KIMLIN, BRADLEY R. GARRIS, and  
CHARLES F. WARREN, *Administrative Patent Judges*.

KIMLIN, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1-18, 20, and 29.

Claims 1, 20, and 29 are illustrative:

1. A method for forming an optical waveguide on a substrate in a process chamber, the method comprising:

depositing an undercladding layer over the substrate;

forming a plurality of separated optical cores over the undercladding layer, the plurality of optical cores defining a sequence of gaps;

depositing a first uppercladding layer over the plurality of cores and within the gaps with a high-density plasma process having a deposition-sputter ratio between 3:1 and 10:1 to partially fill the gaps, wherein the deposition-sputter ratio is defined as the ratio of a sum of a net deposition rate and a blanket sputtering rate to the blanket sputtering rate for the high-density plasma process; and

depositing a second uppercladding layer over the first uppercladding layer with a PECVD process to completely fill the gaps.

20. The method recited in claim 1 wherein the first uppercladding layer has a refractive index between about 1.4443 and 1.4473 at a wavelength of 1550 nm.

29. The method recited in claim 1 wherein the first uppercladding layer fills the gaps to approximately 75% of a height of the cores and the second uppercladding layer fills a remainder of the gaps.

The Examiner relies upon the following references as evidence of obviousness:

Schneider	US 4,557,561	Dec. 10, 1985
Imoto	US 4,856,859	Aug. 15, 1989
Dragone	US 5,136,671	Aug. 4, 1992
Liu	US 6,117,345	Sep. 12, 2000
Narita	US 6,122,934	Sep. 26, 2000
Bazylenko	US 6,154,582	Nov. 28, 2000
Roszman	US 6,194,038 B1	Feb. 27, 2001
Shieh	US 6,204,200 B1	Mar. 20, 2001
Ngai	US 6,451,686 B1	Sep. 17, 2002
Zhong	US 6,705,124 B2	Mar. 16, 2004

Official Notice, Office Action of Jan. 28, 2005 (bottom of page 6)

Appellant's claimed invention is directed to a method for forming an optical waveguide on a substrate in a process chamber wherein a plurality of separated optical cores are formed over an underclading layer that is deposited upon the substrate. The optical cores define a sequence of gaps

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between them and a first upper cladding layer is deposited within the gaps with a high-density plasma process (HDPCVD). The first upper cladding layer partially fills the gaps and a second upper cladding layer is deposited over the first upper cladding layer with a plasma-enhanced chemical vapor deposition process (PECVD). The HDPCVD process for depositing the first uppercladding layer has a deposition-sputter ratio between 3:1 and 10:1.

As acknowledged by Appellant, the present application is related to U.S. Application 10/020,461, which is also presently on appeal before us for decision (Appeal 2007-1851). The appealed claims of both the present application and the related application recite the formation of a plurality of separated optical cores over an undercladding layer having gaps formed between the cores.

The appealed claims stand rejected under 35 U.S.C. § 103(a) as follows:

- (a) claims 1-7, 13-15, 18, 20, and 29 over Bazylenko in view of Dragone, Liu, and Shieh;
- (b) claim 8 over Bazylenko in view of Dragone, Liu, Shieh, and Ngai;
- (c) claims 9-11 over Bazylenko in view of Dragone, Liu, Shieh, Imoto, and Zhong;
- (d) claim 12 over Bazylenko in view of Dragone, Shieh, Liu, Zhong, Imoto, and Schneider;
- (e) claim 16 over Bazylenko in view of Dragone, Liu, Shieh, and Rossman; and

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(f) claim 17 over Bazyleenko in view of Dragone, Shieh, Liu, Rossmann, and Narita.

With the exception of claims 20 and 29, Appellant does not set forth an argument that is reasonably specific to particular claims on appeal. Accordingly, with the noted exceptions, all the appealed claims stand or fall together with claim 1. Also, with the exception of the rejections of claims 20 and 29, we will limit our consideration to the Examiner's rejection of claim 1.

We have thoroughly reviewed each of Appellant's arguments for patentability. However, we fully concur with the Examiner that the claimed subject matter would have been obvious to one of ordinary skill in the art within the meaning of § 103 in view of the applied prior art. Accordingly, we will sustain the Examiner's rejections for essentially those reasons expressed in the Answer, and we add the following primarily for emphasis.

For the reasons discussed in our Decision involving the related appeal (Appeal 2007-1851), we find that the applied prior art establishes the obviousness of forming an optical waveguide by depositing an undercladding layer over a substrate, forming a plurality of separated optical cores over the undercladding layer which define a sequence of gaps between the cores, and depositing an uppercladding layer within the gaps and over the plurality of cores. Also, Appellant has not contested the Examiner's legal conclusion that it would have been obvious for one of ordinary skill in

the art to perform the HDPCVD process of Bazylenko with a deposition-sputter ratio within the claimed range, based on the teachings of Liu and Shieh (*see Answer 7, first two paras.*).

A principal argument advanced by Appellant is that the cited prior art, particularly Liu, does not evidence the obviousness of using an HDPCVD process to partially fill the gaps between the cores and then use a PECVD process to completely fill the gaps with the uppercladding layer. Appellant emphasizes the disclosure of Liu that the HDPCVD process “is performed until the gap **36** is substantially filled. . . .” (col. 9, ll. 6-7). Appellant contends that the Liu disclosure teaches away from the claimed step of only partially filling the gaps with the HDPCVD process.

We are not persuaded by Appellant’s argument. First, we concur with the Examiner that there is no meaningful, patentable distinction between the claimed step of partially filling the gaps and Liu’s substantially filling the gaps. The appealed claims fail to define any percentage value related to partially filling. Therefore, the appealed claims broadly encompass methods wherein less than 100% of the gaps are filled, e.g., 99%, 98%, etc. On the other hand, it is reasonable to conclude that the substantial filling of Liu is also less than 100%, e.g., 99%, 98%, etc. Consequently, we find the Examiner’s reasoning to be sound that there is no patentable distinction between Appellant’s partial filling and Liu’s substantial filling.

In addition, it is clear from Liu’s figure 4 that the first uppercladding layer 38 does not completely fill the gap between the electrical components

which are defined by upper elements 28 and 38. The gaps are defined by more than just wiring 24.

Moreover, even if Liu were interpreted as completely filling the gaps with the HDPCVD process, we completely agree with the Examiner that it would have been a matter of obviousness for one of ordinary skill in the art to use the HDPCVD process to only partially fill the gaps and use the PECVD process to complete the deposition of the uppercladding layer. As explained by the Examiner, Liu discloses that the PECVD process affords a higher speed of deposition than is typical of HDPCVD processes. As a result, one of ordinary skill in the art would have understood that a balance can be effected between the benefits achieved by the slower HDPCVD process and the faster PECVD process. Liu discloses that the HDPCVD process deposits “a dielectric layer having superior density, moisture resistance and planarization properties as compared to conventional CVD dielectric layers” (sentence bridging col. 4-5), while also producing a void-free gap filling. Liu also discloses that “[a]nother advantage of the use of HDPCVD to deposit intermetal dielectrics is that it is generally not necessary to perform subsequent high temperature densification steps to densify the deposited dielectric material, which may sometimes be required to densify oxide layers deposited using conventional CVD and other techniques” (col. 6, ll. 5-10). Manifestly, it would have been obvious for one of ordinary skill in the art to perform a cost-benefit analysis in determining the amount of uppercladding layer to be deposited by the

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HDPCVD and PECVD processes. Appellant has not argued, let alone established with requisite objective evidence, that the benefits espoused by Liu for HDPCVD deposition are not sacrificed when using it to only partially fill the gaps.

We are not persuaded by Appellant's argument that "Liu is drawn from the electronic-device arts rather than the optical-device arts" (principal Br. 8, last sentence). In our view, since both Appellant and Liu are directed to filling gaps with a high aspect ratio, one of ordinary skill in the art would have had a reasonable expectation that the HDPCVD process of Liu would be as effective in filling the gaps in an optical device as in an electronic device.

Regarding the separately argued claim 20 recitation of the uppercladding layer having a refractive index between "about 1.4443 and 1.4473," we agree with the Examiner that the "about" language fails to distinguish over the refractive index of 1.45 disclosed by Bazylenko. It is well settled that the claim term "about" allows for some variation from the stated value. *In re De Vaney*, 185 F.2d 679, 683, 88 USPQ 97, 101 (CCPA 1950); *In re Ayers*, 154 F.2d 182, 185, 69 USPQ 109, 112 (CCPA 1946). Moreover, we find that it would have been a matter of obviousness for one of ordinary skill in the art to determine the optimum refractive index for the uppercladding layer which correspond to the objectives of a specific optical device.

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As for the separately argued recitation of claim 29 that the first uppercladding layer fills the gaps to approximately 75% of the height of the cores, we are convinced, for the reasons set forth above, that it would have been obvious for one of ordinary skill in the art to conduct a typical cost-benefit analysis to determine how much of the gaps are filled by the HDPCVD process.

As a final point, we note that Appellant bases no argument upon objective evidence of nonobviousness, such as unexpected results.

In conclusion, based on the foregoing and the reasons well stated by the Examiner, the Examiner's decision rejecting the appealed claims is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2006).

AFFIRMED

clj

Townsend and Townsend and Crew LLP/AMAT  
Two Embarcadero Center  
Eighth Floor  
San Francisco, CA 94111-3834