

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 20

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TAKAO NAKAMURA AND
MICHITOMO IIYAMA

Appeal No. 2000-0281
Application 08/907,494

ON BRIEF

Before KRATZ, TIMM, and MOORE, Administrative Patent Judges.

MOORE, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1 - 7 and 12-15. Claims 9-11 have been canceled. Claim 8 is indicated to be allowable if rewritten to include all the limitations of the claims from which it depends.

CLAIMS

Claim 1 is representative of the claims on appeal and reads as follows:

1. A method for preparing a layered structure comprising a lower thin film composed of an oxide superconductor and an upper thin film composed of a material different from the oxide superconductor on a substrate wherein the lower thin film is deposited by a molecular beam deposition process and the upper thin film is deposited by a process other than a molecular beam deposition process, having a deposition rate faster than that of the molecular beam deposition process.

THE REFERENCES

In rejecting the appealed claims under 35 U.S.C. §103(a), the Examiner relies on the following references:

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| Nakamura et al. (Nakamura) | 5,423,914 | Jun. 13, 1995 |
| Cho et al. (Cho) (Japanese Unexamined Patent) ¹ | JP 63-274190 | Nov. 11, 1988 |
| Kingston et al., Appl. Phys. Lett. 56(2), January 8, 1990 (Kingston) | | |

THE REJECTIONS

Claims 1-2, 6-7, and 12-14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamura in view of Kingston.

Claims 3-5 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamura in view of Kingston, further in view of Cho.

¹ All citations to this reference are to the English translation of record.

DISCUSSION

The Invention

The Appellants' invention relates to a method for preparing a layered structure having a lower thin film oxide superconductor and an upper thin film of a different material, both on a substrate. The lower film is deposited by a molecular beam deposition process, and the upper thin film is deposited at a faster rate than the molecular beam deposition process by a process other than molecular beam deposition, such as pulsed laser deposition or chemical vapor deposition. See, e.g., Claims 1, 2, and 3.

The Rejection Under 35 U.S.C. § 103(a) Over Nakamura in view of Kingston

Claims 1-2, 6-7, and 12-14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamura in view of Kingston.

The Examiner has found that Nakamura teaches a process of forming a layered structure by depositing a superconducting YCBO film on a substrate by MBE sputtering at a rate of 1 nm/min; cooling the deposited superconducting film, and depositing a dielectric SrTiO₃ (STO) film on the superconducting film by MBE at a deposition rate of 1.2 nm/min. (Examiner's Answer, page 3, lines 14-18).

The Examiner has further found that it is well known in the art to deposit a SrTiO₃ film on a YBa₂Cu₃O_x superconducting film by a pulsed laser ablation process, relying on Kingston, page 190, col. 1, lines 24-25 as evidence thereof. (Examiner's Answer, page 4, lines 4-6). The Examiner this found that the MBE method of Nakamura is

functionally equivalent to the pulsed laser ablation process of Kingston (Examiner's Answer, page 4, lines 8-10).

The Examiner thus concludes that it would have been obvious to one of ordinary skill in the art to have substituted the MBE deposition method of Nakamura with its functional equivalent, a laser ablation method of Kingston, with an expectation of success. (Examiner's Answer, page 4, lines 7-10). Such substitution, it is said, results in maintaining the claimed faster deposition of the upper layer (Examiner's Answer, page 4, lines 10-15).

In response, the Appellants state that "the art fails in the first instance to suggest combining different deposition processes when making more than one layer." (Appeal Brief, page 5, lines 19-21). Further, appellants contend:

"[b]oth Nakamura and Kingston use the same type of process to deposit an oxide superconductor and overlying dielectric layer. The combination of the two references is devoid of any suggestion or teaching of combining a technique from one with a technique from the other, thereby leading to the use of two different deposition processes as presently claimed. Indeed, such a combination would have been contrary to generally accepted practices in this field, whereby the same type of process, in the same apparatus, is used to deposit the two layers. Using this approach, no additional apparatus is necessary and it is possible to deposit both films by changing only the raw material and deposition conditions. Moreover, the risk of contamination of the surface of the first layer is reduced if it remains in the same apparatus. Processes which use a single technique and apparatus are thus deemed to be simpler and better, and absent some reason for proceeding contrary to this practice, a person of ordinary skill in the art would not have been motivated to do what applicants have done and use different techniques for depositing each of the layers." (Appeal Brief, page 5, line 27- page 6, line 11).

The Examiner has responded to this argument by repeating his previous argument, by noting:

"the Examiner has shown that MBE, laser ablation, CVD, and MOCVD are functional equivalent deposition methods for depositing the STO films. Because substitution of equivalents requires no express motivation according to In re

Fount [sic - In re Fout] [citations omitted]; In re Siebentritt [citations omitted], therefore, to substitute the MBE process in Nakamura et al by laser ablation, CVD or MOCVD for depositing the upper film would have been obvious to one of ordinary skill in the art. (Examiner's Answer, page 7, lines 13 - 19).

While we agree generally that the substitution of equivalents is obvious, the determination of obviousness must be made on the evidence of record as compared to the claimed subject matter as a whole.

Section 103(a) of the patent statute provides as follows:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made. 35 U.S.C. Section 103(a) (1994). (emphasis added)

The claimed subject matter as a whole claims a two step deposition process in which the oxide superconductor is deposited on a substrate by molecular beam, and the upper thin film is deposited by another, faster, process other than molecular beam deposition. This is a two step deposition with different deposition types in the same process.

Our review of the cited prior art indicates that each, while relating to a multi-step deposition, utilizes the same deposition types. Nakamura uses molecular beams to create an oxide superconductor layer (col. 7, lines 60-68), then a layer of dielectric film deposited using the same set-up (col. 8, lines 16-32). Kingston teaches growing layers in situ using an excimer laser (Abstract, line 2).

However, none of the cited references teach a mixed deposition process. The Appellants have strongly urged that switching from molecular beam to some other form

of deposition has drawbacks such as increased complexity, expense, and risk of contamination, and would have been contrary to the generally accepted practices in the field. (Appeal Brief, page 6, lines 1-11).

The Examiner has not chosen to respond to this argument or provide additional prior art or other forms of evidence to support his position. Instead, the Examiner merely states that substituting “the MBE process in Nakamura et al by laser ablation, CVD or MOCVD for depositing the upper film would have been obvious to one of ordinary skill in the art” because it is the substitution of equivalents. (Examiner’s Answer, page 7, lines 13-19). We are left to ponder why only the upper film would be substituted, and not both or the lower film only. In the absence of some evidence of record to support the Examiner’s position on obviousness, we are constrained to reverse this rejection.

The Rejection Under 35 U.S.C. §103(a) Over Nakamura in view of Kingston and Cho

Claims 3-5 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamura in view of Kingston, further in view of Cho.

We reverse this rejection for the reasons outlined above. We further note, for completeness, that Cho teaches a “vapor-growth device that utilizes a high frequency magnetron sputtering device” (page 4, lines 6-7) to sputter YBCO, then STO (page 4, lines 7 - 16). Nowhere in Cho have we found evidence to support switching deposition methods. The Examiner has failed to meet his burden of providing evidence to support his position. Accordingly, we are constrained to reverse this rejection as well.

Summary of Decision

The rejection of claims 1-2, 6-7, and 12-14 under 35 U.S.C. § 103(a) over Nakamura in view of Kingston is reversed.

The rejection of claims 3-5 and 15 under 35 U.S.C. § 103(a) over Nakamura in view of Kingston, further in view of Cho is reversed.

REVERSED

EDWARD C. KIMLIN
Administrative Patent Judge

JEFFREY T. SMITH
Administrative Patent Judge

JAMES T. MOORE
Administrative Patent Judge

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