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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/778,648	07/17/2007	MENGQI YE	AM-11065	1825
60300	7590	03/13/2013	EXAMINER	
LAW OFFICES OF CHARLES GUENZER ATTN: APPLIED MATERIALS, INC. 2211 PARK BOULEVARD P.O. BOX 60729 PALO ALTO, CA 94306			MCDONALD, RODNEY GLENN	
			ART UNIT	PAPER NUMBER
			1756	
			MAIL DATE	DELIVERY MODE
			03/13/2013	PAPER

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MENGQI YE, KEITH A. MILLER, PEIJUN DING,
GOICHI YOSHIDOME, and RONG TAO

Appeal 2012-000951
Application 11/778,648
Technology Center 1700

Before BRADLEY R. GARRIS, TERRY J. OWENS, and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

GARRIS, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's decision rejecting claims 1-5, 9-20, and 22-25. We have jurisdiction under 35 U.S.C. § 6.

We AFFIRM-IN-PART.

Appellants claim a method of sputtering a metal chalcogenide capable of forming crystal and amorphous forms comprising maintaining a temperature of a substrate containing a hole above a minimum temperature such that the metal chalcogenide deposits within the hole in crystalline form (claim 1). Appellants claim a similar method comprising maintaining a temperature of a shield in a sputtering chamber to a temperature at which the crystalline and not the amorphous phase forms on the shield (claim 19). Finally, Appellants claim a method of sputtering a metal chalcogenide target which comprises applying to the target a repetitive pulse form having a positive portion of a duration less than that of a negative portion (claim 16).

Claims 1, 16, and 19, the only independent claims on appeal, read as follows:

1. A method of sputtering a material comprising a metal chalcogenide capable of forming in a crystalline form and an amorphous form, comprising:

- magnetron sputtering a target comprising the metal chalcogenide; and
 - maintaining a temperature of a substrate containing a hole in a dielectric layer and disposed in opposition to the target at a selected

temperature above a minimum temperature such that the metal chalcogenide deposits within the hole in crystalline form.

16. A method of sputtering a metal chalcogenide target disposed in a plasma sputtering chamber, comprising:

applying to the target a repetitive pulse form having a repetition frequency of between 10 and 350kHz and having a positive portion of a duration less than that of a negative portion.

19. A method of plasma sputtering a target comprising a metal chalcogenide capable of forming either an amorphous or a crystalline phase of a material of the target on a substrate,

comprising:

maintaining a temperature of a shield in the sputtering chamber to a temperature at which the crystalline and not the amorphous phase forms on the shield by coupling a heat source to the shield during the plasma sputtering of the target.

Under 35 U.S.C. § 103 (a), the Examiner rejects independent claim 1 as unpatentable over Czubytyj (US 5,825,046 patented Oct. 20, 1998) in view of Li (US 2005/0103621 A1 published May 19, 2005) and Brodsky (US 3,716,844 patented Feb. 13, 1973) and rejects dependent claims 2-5, 9-15, 22, and 23 as unpatentable over these references alone or further in view of other prior art.

The Examiner concludes that, in view of Brodsky, it would have been obvious to maintain the temperature of Czubytyj's substrate such that the metal chalcogenide deposits in crystalline form as required by claim 1 (Ans. 6-7).

Appellants argue that neither Czubytyj nor Brodsky contains any teaching or suggestion of the claim 1 requirement for maintaining substrate temperature such that the metal chalcogenide deposits in crystalline form (App. Br. 9-10). Appellants further argue that, contrary to the Examiner's position, Brodsky expressly teaches depositing the amorphous form while maintaining the temperature below a critical temperature so that the deposited film does not crystallize (*id.* at 9).

Appellants' arguments are persuasive. As correctly explained by Appellants, Brodsky indisputably teaches depositing an amorphous form and maintaining sub-critical temperatures to avoid the crystalline form (Brodsky Col. 3, ll. 18-22). While Czubytyj teaches that the substrate may be heated to control morphology of the phase-change material (col. 9, l. 65-col. 10, l. 2), we agree with Appellants that the Examiner has not provided this record with justification for equating Czubytyj's morphology with the crystalline deposition required by claim 1 (Reply Br. 2).

For the above reasons, we cannot sustain the Examiner's § 103 rejection of independent claim 1 over Czubytyj, Li, and Brodsky or the

corresponding § 103 rejections of dependent claims 2-5, 9-15, 22, and 23 over these references alone or further in view of other prior art.

Under 35 U.S.C. § 103(a), the Examiner rejects independent claim 19 as unpatentable over Brodsky in view of Li and further in view of Ovshinsky (US 5,166,758 patented Nov. 24, 1992), Katsura (US 4,933,063 patented Jun. 12, 1990), and Yamada (US 5,744,016 patented Apr. 28, 1998) and rejects dependent claims 20 and 25 as unpatentable over these references alone or further in view of other prior art.

This rejection relies on the Examiner's finding that Brodsky, Li, and Ovshinsky "teach maintaining the substrate at a heated temperature to deposit crystalline films" (Ans. 15).

The Examiner's finding is not supported by the record of this appeal. As explained above, Appellants correctly argue that Brodsky teaches depositing an amorphous form and maintaining sub-critical temperatures in order to avoid the crystalline form. Appellants also correctly argue that Ovshinsky teaches depositing an amorphous form rather than the claimed crystalline form (App. Br. 12; Ovshinsky col. 10, ll. 12-17). Finally, the Li reference disclosures cited by the Examiner (i.e., the Li Abst. and para. [00053] (*see, e.g.*, Ans. 6, 13)) contain no teaching or suggestion of "maintaining the substrate at a heated temperature to deposit crystalline films" (*id.* at 15).

It follows that we also cannot sustain the Examiner's § 103 rejection of independent claim 19 as unpatentable over Brodsky, Li, Ovshinsky, Katsura, and Yamada or the corresponding § 103 rejections of dependent claims 20 and 25 as unpatentable over these references alone or further in view of other prior art.

Finally, under 35 U.S.C. § 103(a), the Examiner rejects independent claim 16 as unpatentable over Li in view of Sellers (US 5,810,982 patented Sep. 22, 1998) and rejects dependent claims 17, 18, and 24 as unpatentable over these references alone or further in view of other prior art.

As an initial matter, we observe that Appellants do not present separate arguments specifically directed to the dependent claims under rejection including separately rejected dependent claim 24 (App. Br. 11-12). Therefore, dependent claims 17, 18, and 24 will stand or fall with independent claim 16.

The Examiner finds that Li teaches applying a repetitive pulse form to a metal chalcogenide target at a repetition frequency within the claim 16 range (Ans. 13). The Examiner concedes that Li does not teach a repetitive pulse form having a positive portion of a duration less than that of a negative portion as claimed but finds that Sellers teaches this claim feature (*id.*). Based on these findings, the Examiner concludes that it would have been *prima facie* obvious to provide the repetitive pulse form of Li with a positive

portion duration less than that of a negative portion in accordance with the teaching of Sellers (*id.* at 14).

Appellants argue that the pulsing of Sellers is applied to a reactive sputter deposition to prevent arcing and that Li does not involve reactive sputtering or the problems solved by Sellers (App. Br. 11-12)¹.

In the “Response to Argument” section of the Answer, the Examiner explains that the teaching of Sellers relates to conventional as well as reactive sputtering and therefore is applicable to the conventional sputtering of Li (Ans. 25 citing Sellers col. 4, ll. 14-22). We agree with this explanation and observe that Appellants do not refute it in their Reply Brief. We further observe that Li seeks to avoid target arcing (para. [0047]) and that target arcing is eliminated by the Sellers process (col. 4, ll. 14-17) as Appellants acknowledge (App. Br. 11).

Under these circumstances, we agree with the Examiner that it would have been *prima facie* obvious to combine the teachings of Li and Sellers in the manner proposed above in order to avoid target arcing. On this record,

¹ Appellants also argue that "Li . . . does not satisfy the claim limitation that the metal chalcogenide is capable of forming in either an amorphous or a crystalline form" (*id.* at 11). This argument and the Examiner's response thereto (Ans. 25-26) are not relevant to the rejection under review because claim 16 contains no such limitation.

Appellants have failed to show error in the Examiner's obviousness conclusion.

We sustain, therefore, the Examiner's § 103 rejection of independent claim 16 as unpatentable over Li in view of Sellers as well as the § 103 rejections of dependent claims 17, 18, and 24 as unpatentable over these references alone or further in view of other prior art.

In summary, we have sustained the rejections of claims 16-18 and 24 but not the rejections of claims 1-5, 9-15, 19, 20, 22, 23, and 25.

The decision of the Examiner is affirmed-in-part.

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

AFFIRMED-IN-PART

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