



US007311942B2

(12) **United States Patent**  
**Derderian et al.**

(10) **Patent No.:** **US 7,311,942 B2**  
(45) **Date of Patent:** **Dec. 25, 2007**

(54) **METHOD FOR BINDING HALIDE-BASED CONTAMINANTS DURING FORMATION OF A TITANIUM-BASED FILM**

(75) Inventors: **Garo J. Derderian**, Boise, ID (US); **Cem Basceri**, Boise, ID (US); **Donald L. Westmoreland**, Boise, ID (US)

(73) Assignee: **Micron Technology, Inc.**, Boise, ID (US)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 508 days.

(21) Appl. No.: **10/230,592**

(22) Filed: **Aug. 29, 2002**

(65) **Prior Publication Data**

US 2004/0043228 A1 Mar. 4, 2004

(51) **Int. Cl.**

- C23C 16/00* (2006.01)
- C23C 16/06* (2006.01)
- C23C 16/08* (2006.01)
- H01L 21/44* (2006.01)
- H01L 21/31* (2006.01)
- H01L 21/469* (2006.01)

(52) **U.S. Cl.** ..... **427/255.391**; 427/250; 427/253; 427/255.36; 427/255.39; 438/680; 438/685; 438/785

(58) **Field of Classification Search** ..... 427/250, 427/253, 255.36, 255.39, 255.391; 438/680, 438/685, 785

See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

- 4,696,833 A \* 9/1987 Monnig et al. .... 438/778
- 5,357,130 A \* 10/1994 Scholz et al. .... 257/288
- 5,377,429 A 1/1995 Sandhu et al. .... 34/586
- 5,393,565 A \* 2/1995 Suzuki et al. .... 427/255.391

5,571,572 A *	11/1996	Sandhu .....	427/585
5,595,784 A *	1/1997	Kaim et al. ....	427/255.391
5,693,377 A	12/1997	Westmoreland et al. ....	427/582
5,698,022 A *	12/1997	Glassman et al. ....	106/287.18
5,700,519 A *	12/1997	Lam .....	427/253
5,745,990 A *	5/1998	Lee et al. ....	29/852
5,824,365 A	10/1998	Sandhu et al. ....	427/239
5,902,651 A	5/1999	Westmoreland et al. ....	427/582
6,022,587 A *	2/2000	Hey et al. ....	427/248.1
6,099,651 A *	8/2000	Sajoto et al. ....	118/715
6,143,192 A	11/2000	Westmoreland .....	216/101
6,143,362 A	11/2000	Sandhu et al. ....	427/255.391
6,162,499 A	12/2000	Sandhu et al. ....	427/239
6,174,750 B1 *	1/2001	Onabe et al. ....	438/56
6,184,136 B1 *	2/2001	Iyer et al. ....	438/685
6,201,219 B1	3/2001	Sandhu et al. ....	219/390
6,206,971 B1 *	3/2001	Umotoy et al. ....	118/715
6,284,316 B1	9/2001	Sandhu et al. ....	427/255.391
6,364,954 B2 *	4/2002	Umotoy et al. ....	118/715
6,436,820 B1 *	8/2002	Hu et al. ....	438/656
6,451,214 B1	9/2002	Westmoreland .....	216/6
6,454,957 B1	9/2002	Westmoreland .....	216/53
6,458,416 B1	10/2002	Derderian et al. ....	427/301

(Continued)

*Primary Examiner*—Timothy Meeks  
*Assistant Examiner*—Kelly M Stouffer  
(74) *Attorney, Agent, or Firm*—Fletcher Yoder

(57) **ABSTRACT**

A method and apparatus are presented for reducing halide-based contamination within deposited titanium-based thin films. Halide adsorbing materials are utilized within the deposition chamber to remove halides, such as chlorine and chlorides, during the deposition process so that contamination of the titanium-based film is minimized. A method for regenerating the halide adsorbing material is also provided.

**108 Claims, 5 Drawing Sheets**

