

## 论文

### 不同氧气流量对直流磁控溅射TiO<sub>2</sub>薄膜的影响

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摘要:

采用直流反应磁控溅射法,以高纯Ti为靶材,高纯O<sub>2</sub>为反应气体,制备了TiO<sub>2</sub>薄膜.研究了氧气流量对薄膜结晶取向、表面形貌和光学性能的影响.研究发现,TiO<sub>2</sub>薄膜主要呈锐钛矿TiO<sub>2</sub>(101)择优取向,当氧气流量较小时,薄膜中还含有金属Ti(100),氧气流量较大时,薄膜含TiO<sub>2</sub>(101)和TiO<sub>2</sub>(004),成多晶态;薄膜的粗糙度和颗粒大小都随氧气流量的增大而增大;薄膜在400~1100nm可见-近红外波段有较高的透射率并且其吸收峰随着氧气流量的增大而红移,当氧气流量为5sccm时,平均透射率最高.

关键词: TiO<sub>2</sub>薄膜 直流磁控溅射 氧气流量 透射率

### Influence of the Oxygen Flow on TiO<sub>2</sub> Thin Films Prepared by DC Magnetron Sputtering

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Abstract:

TiO<sub>2</sub> thin films were prepared by DC reactive magnetron sputting using high purity Ti as the targets and high O<sub>2</sub> as the reaction gas. The influence of the oxygen flow on the film crystalline orientation, surface morphology and optical properties were studied. The results show that the TiO<sub>2</sub> films is anatase TiO<sub>2</sub> (101) preferred orientation; when the oxygen flow rate is small, the film also contains metal Ti(100); when the oxygen flow was larger, the films containing TiO<sub>2</sub>(101) and (004) into a polycrystalline state; the roughness and particle size of the films increases with oxygen flow; film visible- near-infrared bands have a higher transmission rate and the absorption peak increases with the oxygen flow in the 400~1100 nm redshift; when oxygen flow 5 sccm, the average transmission is largest.

Keywords: TiO<sub>2</sub> thin films DC magnetron sputting Oxygen flow Transmittance

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## 参考文献:

- [1] DUMITRIU D, BALLY A R, BALLIF C, et al. Photocatalytic degradation of phenol by TiO<sub>2</sub> thin films prepared by sputtering [J]. Applied Catalysis B: Environmental, 2000, 25(25): 83-92.
- [2] HU An-ming, ZHANG Xu, PNEG Peng, et al. Hydrothermal growth of free standing TiO<sub>2</sub> nanowire membranes for photocatalytic degradation of pharmaceuticals[J]. Journal of Hazardous Materials, 2011, 189(1): 278-285. 胡安明,张旭,彭鹏,等.光催化降解制药独立的二氧化钛纳线膜的水热法生长[J].有害物质,2011,189(1): 278-285. 
- [3] ZHENG Zi-yao, WANG Zhu, LI Chun-ling, et al. Magnetron sputtering deposition Low-E film and AFM analysis[J]. Semiconductor Optoelectronic, 2005, 26(5): 418. 郑子尧,王柱,李春领,等.磁控溅射法沉积低辐射膜及AFM分析[J].半导体光电,2005,26(5): 418.
- [4] HARIZANOVA A, KOUTZAROVA T. Preparation and characterization of ZnO-TiO<sub>2</sub> films obtained by sol-gel method[J]. Journal of Non-Crystalline Solids, 2011, 357(15): 2840-2845. 
- [5] MUN K S, ALVAREZ S D, CHOI W Y, et al. A stable, label-free optical interferometric biosensor based

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[6] DHOLAM R, PATEL N, MIOTELLO A. Efficient H-2 production by watersplitting using indium-tin-oxide/V-doped TiO<sub>2</sub> multilayer thin film photocatalyst[J]. International Journal of Hydrogen Energy, 2011,

36(11): 6519-6528. 

[7] LI Li, ZHANG Gui-you, CHEN Ren-jie, et al. Dye-sensitized solar cell and TiO<sub>2</sub> thin film materials research progress[J]. Functional Materials, 2008, 11(39): 1765-1769. 李丽,张贵友,陈人杰,等.染料敏化太阳能电池及TiO<sub>2</sub>薄膜材料研究进展[J].功能材料,2008,11(39): 1765-1769.

[8] CHANTAL G, BERNARD B, CEDRIC D, et al. Physicochemical properties and photocatalytic activities of TiO<sub>2</sub>-films prepared by sol-gel methods[J]. Applied Catalysis Environmental, 2002, 39(4): 331-

342. 

[9] SHI Zhong-bing, TONG Hong-hui, ZHAO Jia-xue, et al. Optimized design of the magnetic field of magnetron sputtering rectangular target[J]. Vacuum and Cryogenics, 2004, 10(2): 112-116. 石中兵,童洪辉,赵嘉学,等.磁控溅射矩形靶磁场的优化设计[J].真空与低温,2004,10(2): 112-116.

[10] LANG Ming, JIANG Hong, XU Hong-wen, et al. Partial pressure of oxygen prepared by magnetron sputtering film and its photocatalytic performance[J]. Glass, 2004, 174(3): 6-9. 郎明,姜宏,徐鸿文,等.氧分压对磁控溅射法制备薄膜及其光催化性能的影响[J].玻璃,2004,174(3): 6-9.

[11] ZHENG S K, WANG T M, XIANG G, et al. Photocatalytic activity of nanostructured TiO<sub>2</sub> thin films

prepared by DC magnetron sputtering method[J]. Vacuum, 2001, 62(4): 361-366. 

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1. 彭鹏;王永昌.一维周期性增益介质的临界长度[J]. 光子学报, 2006,35(5): 729-733
2. 侯识华; 赵鼎; 叶晓军; 钟源; 谭满清; 陈良惠.吸收对垂直腔面发射激光器光学特性的影响[J]. 光子学报, 2005,34(1): 18-21
3. 孔伟金;吴福全;郝殿中;王吉明;邵建达.窄带薄膜偏光分束镜的研制及其性能测试[J]. 光子学报, 2004,33(11): 1373-1376
4. 王瑞;张存喜;聂一行.一维各向异性光子晶体的带隙结构和传输特性[J]. 光子学报, 2007,36(1): 89-93
5. 潘震 赵青南 刘本锋 赵修建.氢化非晶硅薄膜的磁控溅射制备及性能研究[J]. 光子学报, 2008,37(Sup1): 128-130
6. 刘桂强,廖昱博,陈艳,刘忠民.高质量三维光子晶体的实验制备及理论分析[J]. 光子学报, 2009,38(7): 1707-1712
7. 应家驹,王永伸,何永强,周冰,周中亮.全向激光告警系统中窄带滤光片的透射率分析[J]. 光子学报, 2009,38(8): 1892-1896
8. 王震东,赖珍荃,范定环,徐鹏.高择优取向Mo薄膜的直流磁控溅射制备及其电学性能[J]. 光子学报, 2011,40(9): 1342-1345
9. 陈慰宗,郑新亮,卜涛,付灵丽.有限周期的一维光子晶体的透射率及其禁带[J]. 光子学报, 2003,32(1): 101-105
10. 赵晓鹏,渠长振,向礼琴.双液相电流变液的光学透射特征[J]. 光子学报, 2000,29(3): 213-215
11. 赵建林,杨德兴,张振荣,李育林.有机非线性晶体二苯甲酮光学性质的实验研究[J]. 光子学报, 1998,27(3): 280-283
12. 刘晓静,李娜,张斯淇,王婧,巴诺,吴坤鹏,吴向尧,郭义庆.一维新型阶梯函数光子晶体透射特性[J]. 光子学报, 2012,41(10): 1193-1199

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