2006년도 한국표면공학회 추계 학술발표회 논문초록집

저온에서 증착된 TiO_2 박막의 광촉매 특성 분석

The photocatalytic property of TiO_2 films deposited at low temperature

Yeonghun Han*, Seungjae Jung, Jungjoong Lee

131dong 404 ho, School of Materials Science and Engineering, College of Engineering, Seoul National University, Seoul 151-742, Korea

1. Introduction

TiO_2 is one of the most extensively studied coating materials, owing to its wide range of applications. The photocatalytic property of TiO_2 film has been studied extensively. However, most studies have focused on the photocatalytic water/air purification property of TiO_2 film. In this study, the production of TiO_2 films at low temperature was attempted, a high deposition rate can be obtained only when the process is controlled precisely in the 'transition region'. The photocatalytic properties of TiO_2 films were investigated by measuring the photocurrent and decomposition abilities of methylene blue in the TiO_2/ITO electrode cell.

2. Experiment

TiO_2 films were produced by inductively coupled plasma (ICP)-assisted reactive magnetron sputtering without extra heating of the substrate. In spite of the low process temperature, the poly-crystalline anatase phase was obtained. A constant dc power of 400W was applied to the target, and the target voltage was controlled by the oxygen flow rate using a PID controller. The deposition time was 30 min and the thickness of TiO_2 films was about 1100~1200Å. The TiO_2 films were characterized by XRD, AES and RBS. The photocatalytic ability of the TiO_2 film was analyzed by measuring the photocurrent and decomposition rate of methylene blue.

3. Conclusion

Crystalline TiO_2 films were produced without extra heating of the substrate by ICP-assisted reactive magnetron sputtering. In spite of the low deposition temperature, TiO_2 films with the anatase phase were produced at a deposition rate of >400Å/min, which is one of the highest values ever reported. The anatase phase was obtained at a pressure of >10mTorr, while the rutile phase appeared at <10mTorr. The photocatalytic property of the TiO_2 films was analyzed by measuring the photocurrent and the decomposing ability of methylene blue, respectively. The TiO_2 film with the well-crystallized anatase phase generated the current >0.2mA/cm^2 by irradiation of the UV light. It was also observed that the anatase phase effectively decomposed methylene blue by the UV irradiation.

Reference

[1] R. Wang, K. Hashimoto, A. Fujishima, M. Chikuni, E. Kojima, A. Kitamura, M. Shimohigoshi, T. Watanabe, Nature 388 (1997) 431.