PO3026

Visible-light active thin-film WO3 photocatalyst deposited by low-damage hollow-cathode reactive-gas-flow sputtering

Yuzo Shigesato[1], Nobuto Oka[2], Junjun Jia[3]

[1]Aoyama Gakuin University, Sagamihara, Kanagawa, Japan [2]Kindai University, Iizuka-shi, Fukuoka-kenn, Japan [3]Aoyama Gakuin University, Sagamihara, Japan

yuzosige@he.netyou.jp

WO3 is expected to be a semiconductor photocatalyst driven visible light because its band gap ranges from 2.5 to 2.8 eV. We have already reported on photoinduced superhydrophilicity and oxidative decomposition of organic compounds under visible light irradiation on polycrystalline WO3 films deposited by conventional reactive magnetron sputtering [1-5], where deposition rate was very low of around 10 nm/min. In this study, reactive gas flow sputtering (GFS) is adopted to deposit visible-light active photocatalytic WO3 films. GFS encompasses two techniques, namely, hollow-cathode discharge and gas-flow-driven material transport. During the WO3 deposition, a hollow-cathode discharge occurs between a pair of facing rectangular W targets at gas pressures of 90 Pa. A stream of Ar gas was introduced, and directed between the facing targets. The forced Ar stream transported sputtered W atoms to the substrate. O2 reactive gas was supplied in the vicinity of the substrate. The reactive GFS method offers great advantages over conventional reactive magnetron sputtering by providing stable high-rate deposition [6,7]. The WO3 films loaded with Pt (Pt/WO3) were also fabricated. The deposition rate for this process was over 10 times higher than that achieved by the conventional sputtering process. Furthermore, Pt nanoparticle- loaded WO3 films deposited by the GFS process exhibited much higher photocatalytic activity than those deposited by conventional sputtering, where the photocatalytic activity was evaluated by the extent of decomposition of CH3CHO under visible light irradiation [9]. [1] Proceedings of the 3rd ICCG , (2000) 137. [2] Proceedings of the 6th ICCG , (2006) 365. [3] J. Nanosci. Nanotechnol. 12 (2012) 5082. [4] Jpn. J. Appl. Phys. 51 (2012) 055501. [5] J. Vac. Sci. Technol. A 30 (2012) 031503. [6] J. Vac. Sci. Technol. A 26 (4) (2008) 893. [7] Thin Solid Films 532 (2013) 1. [8] APL MATERIALS 3 (2015) 104407.

Keywords
WO3
photocatarist
visible-light activity
gas flow sputtering
hollow-cathode discharge