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利用課題名（日本語）　:
Program Title (English)　:Effect of Titanium Film on Plasmon Induced Photocurrent Generation
利用者名（日本語）　:曹恩
Username (English)　:En Cao
所属名（日本語）　:1) 北海道大学大学院情報科学研究科
Affiliation (English)　:1) Graduate School/Faculty of Information Science and Technology, Hokkaido University
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1. 概要（Summary）

Plasmonic photocatalysts have attracted a large amount of research interest in harvesting and conversion of solar energy to drive water splitting through strong localized surface plasmon resonance (LSPR) effect. The LSPR intensity and wavelength can be modulated by manipulating the composition, shape or size of the plasmonic nanostructures. However, the influence of the ultrathin adhesion layer on the plasmon-induced photocurrent generation is unknown.

2. 実験（Experimental）

【利用した主な装置】

超高精度電子ビーム描画装置 (ELS-F125), 電子ビーム蒸着装置 (EB-580S), 高分解能電解放射型走査型電子顕微鏡 (JEOL JSM-6700FT), 原子層堆積装置 (SUNALE-R).

【実験方法】

The TiO_2 film was deposited onto indium tin oxide (ITO) substrate and Au nanodisk patterns were formed on the substrate using EBL system. Then, the 5 nm thick Ti film and 30 nm thick Au film were deposited onto the substrate by electron beam evaporation method to form Au/TiO_2 and Au/Ti/TiO_2 photoanode. The extinction spectrum of the sample was characterized using photonic multichannel analyzer (PMA). The three-electrode system was employed to measure the incident photon to current conversion efficiency (IPCE).

3. 結果と考察（Results and Discussion）

We studied the effect of the thickness of Ti film on plasmon induced photocurrent generation. SEM image showed that the diameter of the Au nanodisks is 60 nm. The extinction spectrum of the Au/Ti/TiO_2 system shows that the Ti film would reduce the plasmon dephasing time and scattering amplitude drastically. The IPCE value of the Au/TiO_2 system is 34 times large than that of the Au/Ti/TiO_2 system (Fig. 1c). The increase of plasmon damping at the interface due to the Ti adhesion layer reduces the gain of plasmon induced photocurrent generation.

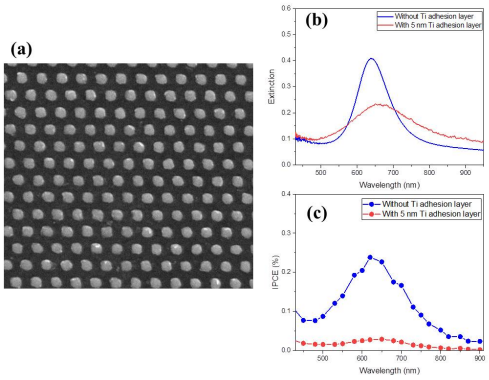

Fig.1. (a) The SEM image of Au nanostructures. (b) Extinction spectra of Au nanodisk with or without the Ti adhesion layer were measured. (c) IPCE action spectra of Au nanodisk with Ti adhesion layer thickness of 0 nm and 5 nm.

4. その他・特記事項（Others）

・参考文献

[1] Shi, X., Ueno, K., Oshikiri, T., Sun, Q., Sasaki, K., & Misawa, H. (2018). Nat. Nanotechnol, 13(10), 953-958

共同研究者:Q. Sun, S. Zu, X. Shi, T. Oshikiri, H. Misawa（Hokkaido Univ.）

5. 論文・学会発表（Publication/Presentation）

なし

6. 関連特許（Patent）

なし