課題番号　　:F-14-HK-0067
利用形態　　:共同研究
利用課題名（日本語）　　:金ナノ粒子を担持した酸化チタン／FTO 電極の光電変換特性
Program Title (English)　　:Plasmon-enhanced photocurrent generation on gold nanoparticles loaded TiO_2/FTO electrode
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1. 概要（Summary）

Titanium dioxide is one of the most promising semiconductors for photocurrent generation splitting as well as photochemical water. However, only a small amount of solar energy (less than 4%) can be used to drive this reaction due to its short wavelength cutoff. In present study, plasmonic gold nanoparticles were employed to enhance the photocurrent generation of TiO_2 in visible wavelength region.

2. 実験（Experimental）

·Apparatus

Scanning electron microscopy, Helicon sputtering system, X-ray Diffraction

·Method

TiO_2 was deposited onto the FTO by a reactive direct current magnetron sputtering process in an O_2/N_2/Ar atmosphere. For depositing Au nanometer thin layer onto TiO_2, an RF magnetron sputtering process was used. To create Au nanoparticles the as-synthesized metal/TiO_2 samples were annealed at 400℃. After two synthesis cycles were performed, the Au nanoparticle size distribution of 10-30 nm was observed.

3. 結果と考察（Results and Discussion）

Figure 1 (a) shows the I-V curves of Au nanoparticles loaded TiO_2/FTO photoelectrode. Clear visible light photocurrent respond was observed under 620 nm wavelength incident light irradiation. The SEM characterization of the surface morphology of Au nanoparticles loaded TiO_2 was inserted in Figure 1 (a). Au nanoparticles with size distribution of 10-30 nm were decorated on the TiO_2. Figure 1 (b) shows the IPCE action spectrum of Au nanoparticles loaded TiO_2/FTO photoelectrode. Due to the plasmon enhancement of Au nanoparticles, an obvious IPCE action spectrum band at around 600 nm was observed. Under the plasmon excitation in visible wavelength region, the charge separation occurred at the interface of Au nanoparticles and TiO_2, and resulted in photocurrent generation in visible wavelength region. In summary, the plasmon-enhanced photocurrent generation have been successfully demonstrated on TiO_2 layer that fabricated by physical vapor deposition.

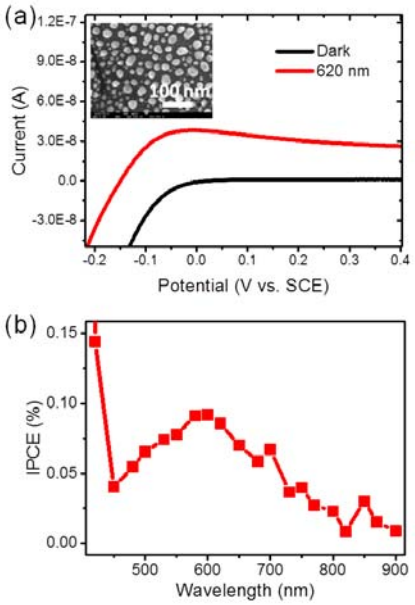

Figure 1. I-V curves (a) and IPCE action spectrum (b) of Au nanoparticles loaded TiO_2/FTO photoelectrode. The inset in (a) shows the SEM image of Au nanoparticles loaded TiO_2/FTO.

4. その他・特記事項（Others）

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5. 論文・学会発表（Publication/Presentation）

なし

6. 関連特許（Patent）

なし