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利用形態 : 共同研究
利用課題名(日本語) : 酸化チタンフィルム上に配置した金ナノディスクの過渡吸収分光
Program Title(English) : Transient absorption spectroscopy of gold nanodisk on titanium dioxide thin film
利用者名(日本語) :
Username(English) : Qi-Dai Chen
所属名(日本語) : 吉林大学電子科学工程学院
Affiliation(English) : Department of Electrical Engineering, Jilin University, China
キーワード/Keyword : Transient absorption, Au nanodisk, titanium dioxide、成膜、リソグラフィ・露光・描画装置

1. 概要(Summary)

We investigated transient absorption of Au nanodisks on TiO₂ thin film and SiO₂ for understanding the charge separation dynamics.

2. 実験(Experimental)

【利用した主な装置】

原子層堆積装置 Atomic layer deposition (Picosun SUNALE-R), 電子ビーム描画装置(ELS-F125-U), ヘリコンスパッタ装置 Helicon sputtering, 電界放射型走査型電子顕微鏡 Scanning electron microscope (JSM-6700FT)

【実験方法】

TiO₂ thin film was deposited onto SiO₂ substrate by atomic layer deposition (ALD) system. Au nanodisks were designed by using electron-beam lithography system operating at 125 kV. After development, a 20nm thick Al layer was deposited by Helicon sputtering, and then the residual resist was removed by lift-off process. For comparison, Au nanodisks were also fabricated on SiO₂ substrate by the same method.

3. 結果と考察(Results and Discussion)

Scanning electron microscope (SEM) images of Au nanodisks on 200 nm TiO₂ thin film and SiO₂ are shown in Figure 1. By using femtosecond transient absorption spectroscopy with different wavelength range probe (white light and near IR probe), we explored the dynamics of hot electron transfer from Au nanodisks to the conduction band of TiO₂. In the measurement of white light probe, we compared the transient absorption spectra of

Au/TiO₂ and Au/SiO₂ at different times. An obvious shift of the bleaching peak of Au nanodisks can be detected in the Au/TiO₂ system. In addition to the thermal mechanism, the electron transfer between Au nanodisks and TiO₂ becomes important. The transient absorption spectra among different substrates and excited wavelengths were investigated, which provided a fine-analysis for understanding the charge separation between Au nanodisks and TiO₂.

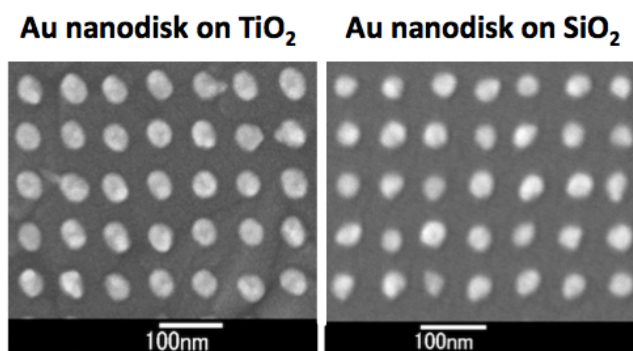


Fig. 1 SEM images of Au nanoparticles on TiO₂ thin film and SiO₂.

4. その他・特記事項(Others)

・参考文献

- (1) A. Furube et al., *J. Am. Chem. Soc.*, **2007**, 129,14852-14853.
- (2) Y. Nishijima et al, *J. Phys. Chem. Lett.*, **2010**, 1, 2031-2036.

共同研究者: J. Li, K. Ueno, Q. Sun, X. Shi, T. Oshikiri, H. Misawa

5. 論文・学会発表(Publication/Presentation)

なし