

課題番号 : F-16-HK-0045
利用形態 : 機器利用
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粒子の過渡吸収分光
Program Title(English) : Transient absorption spectroscopy of gold nanoparticles on titanium dioxide thin film
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1. 概要(Summary)

We investigated transient absorption of Au nanoparticles on TiO₂ thin film and quartz 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), 高分解能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 quartz substrate by atomic layer deposition (ALD) system. After thermal evaporation of 3 nm Au film, the sample was annealed in N₂ atmosphere at 300°C for 2 hour, so that the gold nanoparticles were formed on the TiO₂ thin film.

3. 結果と考察(Results and Discussion)

Scanning electron microscope (SEM) image of Au nanoparticles on 30 nm TiO₂ thin film is shown in Figure 1(a). The extinction spectrum (Figure 1b) represents the plasmon resonance band of the Au nanoparticles, which is centered at about 600 nm. By using femtosecond transient absorption spectroscopy with different wavelength range probe, we explored the dynamics of hot electron transfer from Au nanoparticles to the conduction band of TiO₂. In addition to infrared probe method, we compared the transient absorption spectra of Au/TiO₂ and Au/quartz in visible and UV wavelength ranges, which provide a fine analysis for understanding the charge separation between Au nanoparticles and TiO₂ thin film.

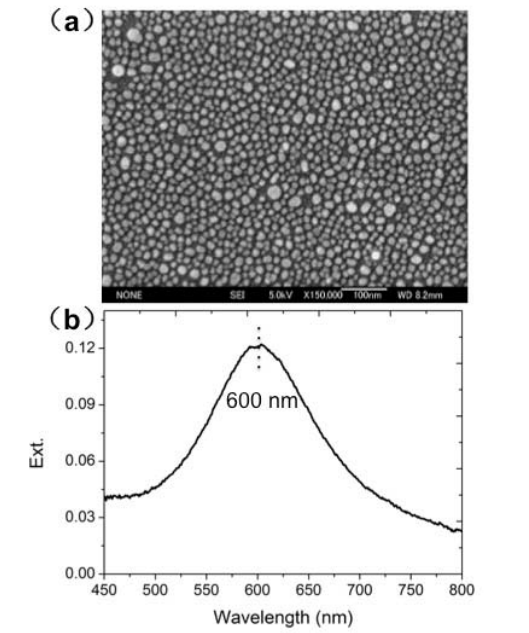


Fig. 1 SEM images (a) and extinction spectrum (b) of Au nanoparticles on TiO₂ thin film.

4. その他・特記事項(Others)

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・参考文献

(1) A. Furube et al., Journal of the American Chemical Society, 129, (2007) 14852-14853.

5. 論文・学会発表(Publication/Presentation)

(1) J. Li et al., Annual Meeting on Photochemistry, 2016. (Poster)

(2) J. Li et al., the 17th RIES-Hokudai international symposium, 2016. (Poster)