

課題番号 : F-19-HK-0028  
 利用形態 : 共同研究  
 利用課題名(日本語) :  
 Program Title (English) : Fluorescence of perovskite nanocrystals under modal strong coupling conditions  
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 キーワード/Keyword : Perovskite Nanocrystals, Fluorescence, Modal strong Coupling, 成膜・膜堆積

### 1. 概要(Summary)

We have successfully demonstrated that the quantum efficiency of the water splitting was enhanced under the modal strong coupling conditions on an Au nanoparticle/TiO<sub>2</sub>/Au-film (ATA) photoelectrode.<sup>[1]</sup> In this study, using the same ATA structure under modal strong coupling, we investigated the fluorescence of perovskite nanocrystals under the modal strong coupling conditions.

### 2. 実験(Experimental)

#### 【利用した主な装置】

原子層堆積装置 (ALD) (Picosun SUN-R), ヘリコンスパッタリング装置 (ULVAC MPS-4000C1/HC1), 高分解能電界放射型走査型電子顕微鏡 (SEM, JEOL JSM-6700FT)

#### 【実験方法】

A 100-nm Au film was deposited on the surface of silica glass by Helicon sputtering. Titanium dioxide thin films with several tens of nanometers were deposited onto Au film using ALD. Au-NPs was fabricated on TiO<sub>2</sub> thin film by thermal annealing a 3-nm Au thin-film at 300°C. The surface morphology was characterized by SEM.

### 3. 結果と考察(Results and Discussion)

The samples of TiO<sub>2</sub>/Au-film and ATA with inlaid depth of 0 nm and 7 nm were prepared. The absorption spectra of the samples are shown in Fig. 1a. Due to the interaction of the plasmon resonance and the cavity resonance, intense light absorption

appear at around 600 nm for ATA with inlaid depth of 0 nm. When the inlaid depth increases to be 7 nm, obvious modal strong coupling induced dual absorption bands appear, as the green line shown. Using the Au-NPs/TiO<sub>2</sub> and ATA with 0-nm inlaid as control samples, we then started to investigate the fluorescence of perovskite nanocrystal loaded on the surface of the samples. The perovskite nanocrystals were coated on the samples by spin-coating, as shown in Fig. 1b. The quantum efficiency of the photoluminescence of the perovskite nanocrystals will be measured under the strong coupling conditions and normal conditions.

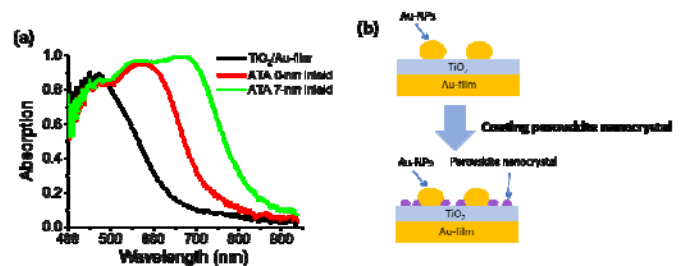


Figure 1. (a) Absorption spectrum of TiO<sub>2</sub>/Au-film and ATA with 0-nm and 7-nm inlaid depth. (b) Schematic of coating perovskite nanocrystals on the samples of ATA structure.

### 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)

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