

課題番号 : F-19-HK-0026
利用形態 : 共同研究
利用課題名(日本語) :
Program Title (English) : Influence of Particle Density on Modal Strong Coupling between Localized Surface Plasmon and Fabry-Pérot Nanocavity Modes
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1. 概要(Summary)

Modal strong coupling between the Fabry-Pérot nanocavity and localized surface plasmon resonance (LSPR) has been studied, and was found to be helpful for enhancing the photocurrent efficiency^[1]. Based on my former result, the coverage ratio (CR) of the metal nanostructure is strongly related to the coupling strength of the modal strong coupling. To further discuss the relation between coupling strength and photoconversion efficiency, well-designed nanostructures are in great demand. In this study, we propose to study the coupling strength effect on the photocurrent generation efficiency.

2. 実験(Experimental)

【利用した主な装置】

超高速スキャン電子線描画装置 (Elionix ELS-F130HM), 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 (JEOL JSM-6700FT), 原子層堆積装置 (Picosun, SUNALE-R), 電子ビーム描画装置 (EB-580), UV オゾンクリーナー (UV-1)

【実験方法】

A 100-nm Au film was deposited onto SiO₂ substrate by sputtering, and then about 200 nm TiO₂ layer was deposited by atomic layer deposition (ALD). Au nanodisks with different CR were fabricated by using an electron-beam lithography and lift-off processes, after the ozone treatment, it was finally inlaid by 7nm of TiO₂ by ALD.

3. 結果と考察(Results and Discussion)

Incident photon-to-current efficiency (IPCE) for structures with different CR were measured (Fig. 1). As a result, the IPCE band was closely corresponding to its absorption band, and IPCE for the structure with stronger coupling strength was found to be enhanced more effectively.

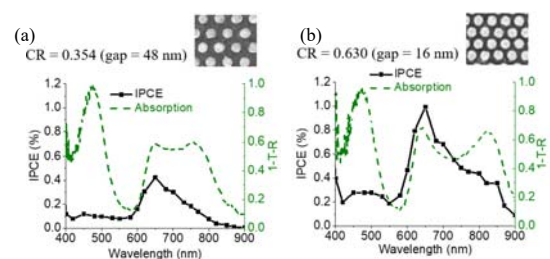


Fig.1 IPCE action spectra for modal strong coupling system of Au-NDs of (a) CR= 0.354 and (b) CR= 0.630.

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