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利用形態 : 機器利用
利用課題名(日本語) :
Program Title (English) : Near-field Distribution under Modal Strong Coupling with Coherent Interaction
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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]. Also, we have previously found that the coherent interaction within the strong coupling structures plays a pivotal role on enhancing the charge carrier generation efficiency. This year, we applied the Au nanodisk cluster (Au NDs)/TiO₂/Au film (ATA) strong coupling structures with various particle number (PN) in the cluster, to investigate coherence effect on the photoemission distribution and the near-field properties.

2. 実験(Experimental)

【利用した主な装置】

超高速スキャン高精度電子ビーム露光装置 130kV (ELS-F130HM), ヘリコンスパッタリング装置 (MPS-4000C1/HC1), 超高分解能走査型電子顕微鏡 (SU8230), 原子層堆積装置(ALD) SUNALE-R), 電子ビーム蒸着装置 (EB-580), 時間分解光電子顕微鏡システム (PEEM-III).

【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 clusters with different PN were fabricated by using an electron-beam lithography and lift-off processes, and the structures were measured by the PEEM.

3. 結果と考察(Results and Discussion)

From the photoemission distribution image, it could be realized that the small PN structures (Fig. 1a) showed a relatively homogeneous photoemission distribution, while the large PN ones (Fig. 1b) showed rim-strong distribution. We considered that this rim-strong distribution is the characteristic of the coherent interaction, and this experiment made us able to visualize the coherence area.

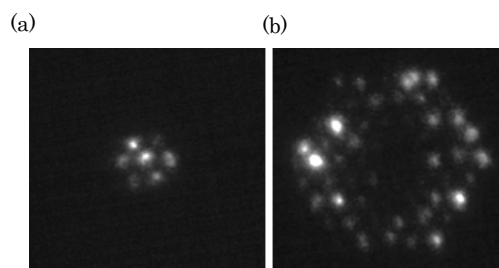


Fig.1 Photoemission distribution image for ATA with PN of (a) 7 and (b) 61.

4. その他・特記事項(Others)

[1] X. Shi, K. Ueno, T. Oshikiri, Q. Sun, K. Sasaki, H. Misawa, *Nat. Nanotechnol.*, 13, 953–958 (2018).
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5. 論文・学会発表(Publication/Presentation)

なし。

6. 関連特許(Patent)

なし。