

課題番号 : F-20-HK-0033
利用形態 : 機器利用
利用課題名(日本語) :
Program Title (English) : Developing a versatile surface-enhanced Raman scattering chips using modal strong coupling
利用者名(日本語) : 臧瀟倩¹⁾
Username (English) : Xiaoqian Zang¹⁾
所属名(日本語) : 1) 北海道大学大学院情報科学研究科
Affiliation (English) : 1) Graduate School/Faculty of Information Science and Technology, Hokkaido University¹⁾
キーワード/Keyword : Modal strong coupling, Surface-enhanced Raman Scattering、成膜・膜堆積

1. 概要(Summary)

We fabricated modal strong coupling structures that composed of gold nanostructures showing localized surface plasmon and TiO₂ thin film/Au-film nanocavity for versatile surface-enhanced Raman scattering (SERS) chips and elucidated their SERS properties on the structures in detail.

2. 実験(Experimental)

【利用した主な装置】

原子層堆積装置 (Picosun SUNALE-R), 超高速スキャン電子線描画装置 (ELS-F130HM), 超高精度電子ビーム描画装置(ELS-F125-U), ヘリコンスパッタリング装置, 多元スパッタ装置(QAM-4-ST), 電子ビーム蒸着装置 (EIKO EB-580), 高分解能電界放射型走査型電子顕微鏡 (SU8230, JSM-6700FT)

【実験方法】

Au-film was deposited on the SiO₂ substrate by Helicon sputtering, and TiO₂ film was fabricated by atomic layer deposition (ALD) system. Au nanodisks (AuNDs) array with different sizes and densities were fabricated on a TiO₂-thin-film/Au-film by electron beam lithography system operating at 130 kV, a 30 nm thick Au layer was deposited by electronic vapor deposition, and then the residual resist was removed by lift-off process. For comparison, AuNDs were also fabricated on TiO₂-thin-film/SiO₂ substrate by the same method.

3. 結果と考察(Results and Discussion)

Scanning electron microscope (SEM) images of

Au nanodisks on TiO₂-thin-film/Au-film/SiO₂ is shown in Figure 1. By using Raman microscopy, we found that the SERS intensity of crystal violet molecules was increased accompanying with the increase of the Au nanodisks density, as shown in Figure. 2.

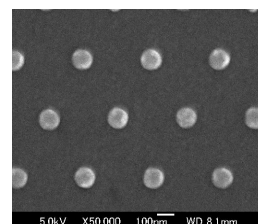


Fig. 1 SEM images of Au nanoparticles on TiO₂ thin

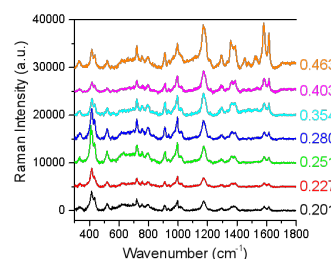


Fig. 2 SERS intensity of crystal violet on AuNDs/TiO₂ thin film/Au-film with different AuNDs density.

4. その他・特記事項(Others)

・参考文献

Y. Yokota, K. Ueno, H. Misawa, *Small*, 7 (2011) 252–258.

X. Shi, K. Ueno, T. Oshikiri, Q. Sun, K. Sasaki, H. Misawa, *Nat. Nanotechnol.*, 13 (2018) 953–958.

5. 論文・学会発表(Publication/Presentation)

なし

6. 関連特許(Patent)

なし