

課題番号 :F-16-OS-0027, S-16-OS-0022
 利用形態 :機器利用
 利用課題名 (日本語) :表面増強ラマン散乱計測に用いる金属ナノ粒子表面のナノ計測
 Program Title (English) :Morphology Imaging of Metal Nanoparticles for SERS Measurement
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1. 概要 (Summary)

We compared the different shaped gold and silver nanoparticles and found that the only rod shape showed highest Raman enhancement at the single nanoparticle level. To find the best choice for SERS measurement, we also studied the self-assembly to get specific nanostructures with multiple hot-spots.

2. 実験 (Experimental)

【利用した主な装置】

SEM Hitachi SU-9000

【実験方法】

Nanotemplates were first fabricated by E-beam lithography, then the nanoparticles were self-assembled into the nanotemplates by evaporation induced self-assembly. In our protocol, the PMMA was used as resist and MIBK:IPA=1:3 as the developer. Then, the gold nanospheres were concentrated in a high density and self-assemble into nanopatterns.

3. 結果と考察 (Results and Discussion)

By E-beam lithography, different shaped templates were fabricated on silicon wafer, as shown in Fig 1. The gold nanoparticles with a diameter of 60 nm in solution can be trapped into these nanopatterns, as shown in Fig 2. The number of nanoparticles in the patterns can be controlled by the size of nanopatterns, as shown in Fig 3. In next year, we will continue to fabricate of nanostructures and study their SERS activities.

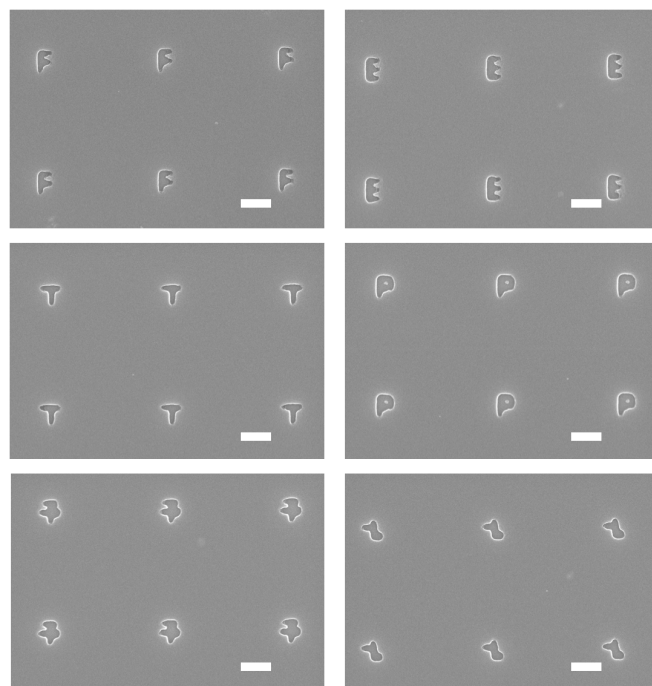


Fig 1. Typical SEM images of nanotemplates for self-assembly of nanoparticles. The scale bars are 500 nm.

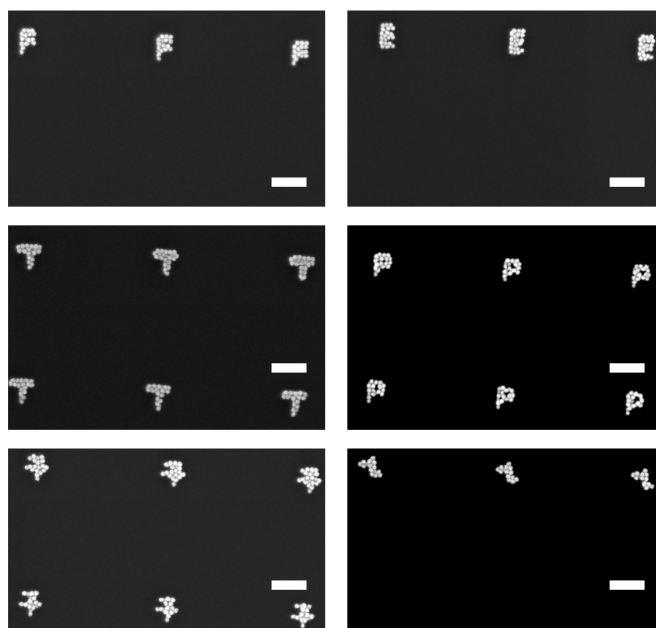


Fig 2. Typical SEM images of self-assembled 60 nm

gold nanoparticles. The scale bars are 500 nm.

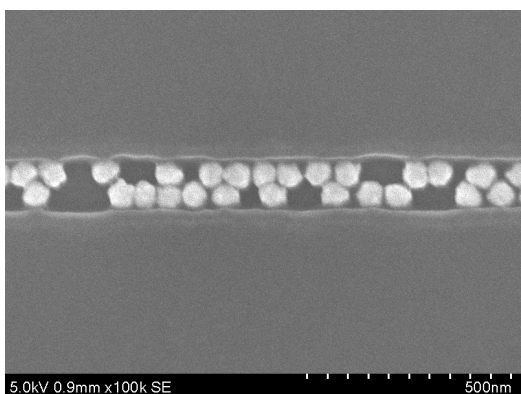
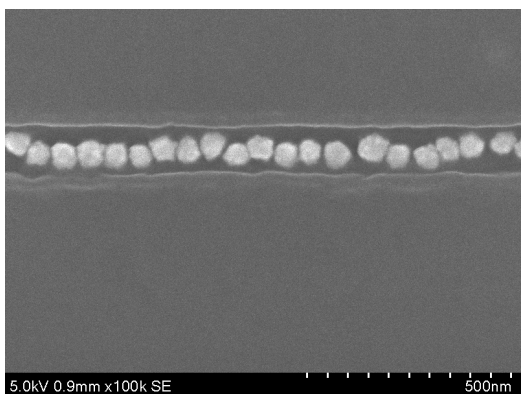


Fig 3. The one line and two lines of self-assembled nanoparticles controlled by the width of nanopatterns.

4. その他・特記事項 (Others)

なし

5. 論文・学会発表 (Publication/Presentation)

(1) Z, Zhang, J. Ando 他, Global Nanophotonics 2016, 平成 28 年 11 月 30 日—12 月 1 日

(2) Z, Zhang et al., ACS Appl. Mater. Interfaces, 9, 44027(2017).

(3) Z, Zhang et al., The international symposium in 2017 "Raman spectroscopy for biomedical applications," in the annual meeting of The Spectroscopical Society of Japan (24 May 2017).

6. 関連特許 (Patent)

なし