

課題番号 : F-14-HK-0062
 利用形態 : 共同研究
 利用課題名(日本語) :
 Program Title (English) : Surface-enhanced Raman scattering of a single molecule on silver nanodisk structure with single-nanometer gap.
 利用者名(日本語) :
 Username (English) : Haifeng Yuan, Johan Hofkens
 所属名(日本語) :
 Affiliation (English) : KU Leuven

1. 概要(Summary)

In this study, silver nanodisks with single-nanometer-wide gap were fabricated by electron beam lithography and lift-off techniques, and monolayers of benzenethiol were formed on the silver nanostructures. Surface enhanced Raman scattering spectra have performed on the structures.

2. 実験(Experimental)

• Apparatus

DC sputtering system, High-resolution electron beam lithography system, Scanning Electron Microscope

• Method

Silver nanodisks with a thickness of 50 nm were fabricated by high-resolution electron beam lithography on a glass substrate at various gap widths from 3 to 15 nm. The glass substrate with nanodisk dimers was directly immersed into 10 mM benzenethiol ethanol solutions for 1 hour. The sample was then subjected to optical measurements (Raman mapping) on a confocal microscope, as illustrated in Fig. 2(a).

3. 結果と考察(Results and Discussion)

Fig. 1 shows typical SEM image of 80 nm silver nanodisks in diameter with gap width of 5 nm. An image of total intensities over the sample area (100 nm disks with a gap width of 5 nm) is given in Fig. 2(b). Each bright spot in the image represent a nanodisk dimer pair. We then plot the Raman image between 1600 cm^{-1} and 1800 cm^{-1} in Fig. 2(c) and several dimers were found SERS active.

Detailed analysis of the SERS spectra have not considered at this time, and we will demonstrate the gap width dependence and so on.

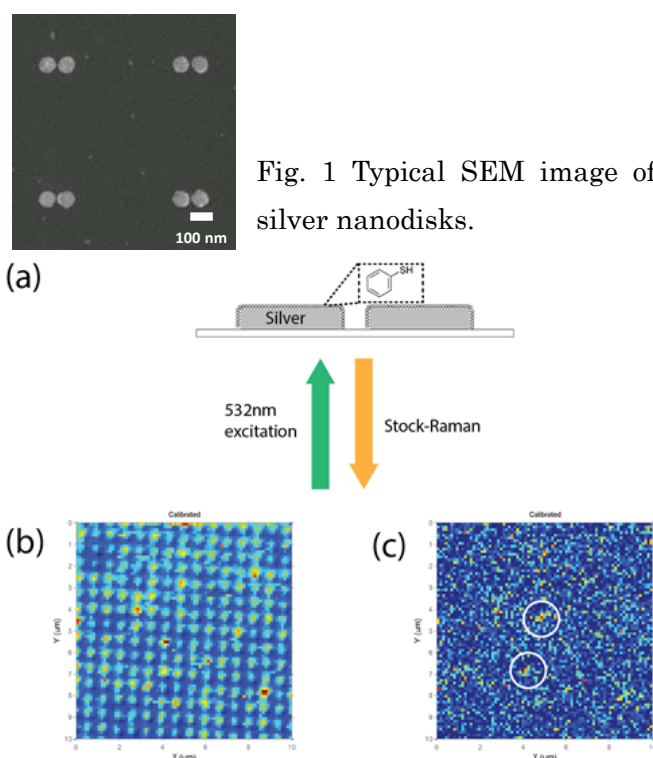


Fig. 1 Typical SEM image of silver nanodisks.

Fig. 2(a) A schematic illustration of the experimental configuration. (b) Raman mapping image of total intensities over a 10 $\mu\text{m} \times 10 \mu\text{m}$ area. (c) Raman mapping image at the wavenumber ranging from 1600 cm^{-1} -1800 cm^{-1} . White cycles highlight the SERS active sites.

4. その他・特記事項(Others)

• 共同研究者等 (Coauthor) : (RIES, Hokkaido University) H. Uehara, T. Oshikiri, K. Ueno, H. Misawa

5. 論文・学会発表(Publication/Presentation)

なし

6. 関連特許(Patent)

なし