

Role of β -silver sulfide solid electrolyte on Ag nanoprotrusion fabrication for surface-enhanced Raman spectroscopy

Chaweewan Sapcharoenkun, Alongkot Treetong, Tuksadon Wutikhun,

Panita Kasamechonchung, Annop Klamcheun

National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA), Pathumthani 12120, Thailand.

chaweewan@nanotec.or.th

In this work, we have developed a facile method to fabricate a high-density of silver nanoprotrusions (Ag NPs) based on β -silver sulfide (β -Ag₂S) solid electrolyte for using as a surface-enhanced Raman spectroscopy (SERS) substrate [1-2]. A chemical bath deposition was chosen to prepare β -Ag₂S solid electrolyte due to its low-cost and high-throughput deposition method [3]. Electron beam irradiation was used to construct Ag NPs due to its short reaction time, high efficiency and the absence of chemical residues after the reaction. The amount of β -Ag₂S has a strong effect on the Ag NPs formation. The highest density of Ag NPs as SERS substrate was found to be 1.03×10^9 filaments/cm². The SERS performance of methylene blue (MB) adsorbed on Ag NPs substrate has been investigated with green laser (532 nm). The maximum SERS enhancement factor of 1.57×10^6 was achieved. The limit of detection of MB obtained from Ag NFs substrate was found to be at 1 μ M.

References:

- [1] Yi, Z., Li, X., Luo, J., Yi, Y., Xu, X., Wu, P., Jiang, X., Wu, W., Yi, Y., Tang, Y., *Plasmonics* **9** (2), 375–379 (2014).
- [2] Fateixa, S., Nogueira, H. I. S., Trindade, T., *Phys. Chem. Chem. Phys.* **17** (33), 21046–21071 (2015).
- [3] Tanaka, H., Akai, T., Tanaka, D., Ogawa, T., *e-Journal Surf. Sci. Nanotechnol.* **12**, 185–188 (2014).