Chloroform-Assisted Selective Metal Deposition on Nanopatterned Polymer

Tae-Gyun Noh[a], Myung-Yung Jeong[a,b,*]

[a] *ESPn Medic, ESPn Medic cooperation, Busan, 46241, Korea*

[b] *Department of Opto-Mechatronics Engineering, Pusan National University, Busan, 46241, Korea*

We proposed a new chloroform-assisted selective metal deposition method on polymer nanopatterns for plasmonic device which is fabricated by nanoimprint. To ensure high nanoplasmonic performance, adhesion of the dielectric-metal interface plays a crucial role. However, the poor adhesion property between the UV-curable resin and metal makes selective metal deposition too difficult during imprinting [1].

To solve this problem, chloroform was introduced. Chloroform acts as a mediator, forming van der Waals bond between UV-curable resin and metal, facilitating the transfer of metal thin film to the nanopatterned polymer during UV-imprinting. The pre-UV exposure step provides additional activation energy to reinforce the chloroform-metal bond, preventing chloroform from quickly vaporizing before subsequent processing after coating the metal thin film with chloroform (Fig. 1).

As a demonstration, 8cm x 8cm scale nanostructure is fabricated that features 50nm Ag thin film is deposited on polymeric nanopattern to enable fidelity with <5% (Fig. 2). To evaluate the adhesion characteristic of Ag selectively deposited on nanopatterned polymer, we measured optical intensity [2]. As a result, the interface bonded using chloroform showed relatively excellent properties.

References

1. Alan K. Mo., et al., Understanding the mechanism of solvent-mediated adhesion of vacuum deposited Au and Pt thin films onto PMMA substrates, Adv. Func. Mat. **23**, 1349 (2013)
2. Kim J. H., et al., Electric field enhancement of coupled plasmonic nanostructures for optical amplification, PhotoniX. **4**, 8 (2023)

[*] *corresponding author e-mail: myjeong@pusan.ac.kr*

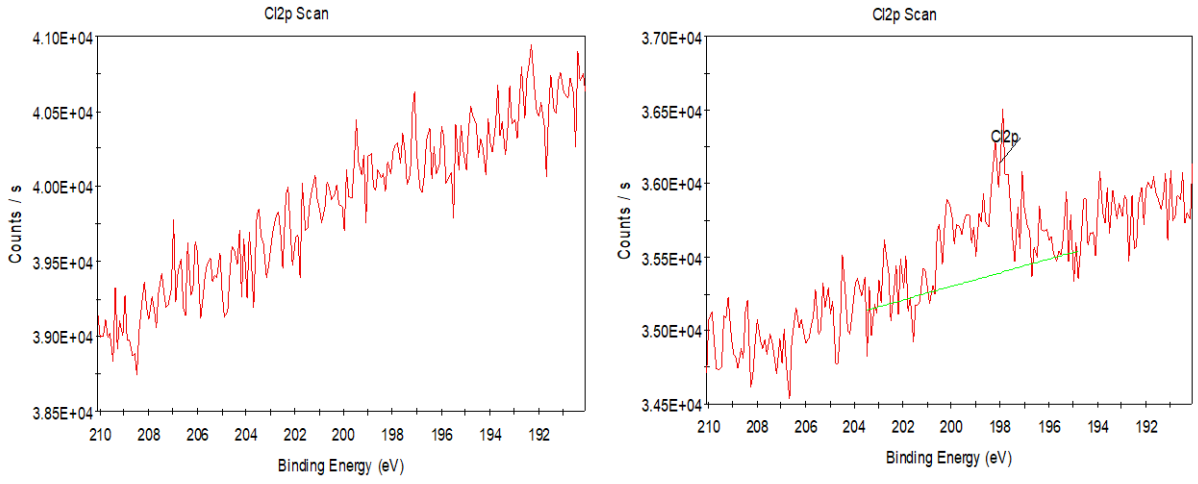

Figure 1. Characterization of pre-UV exposure step

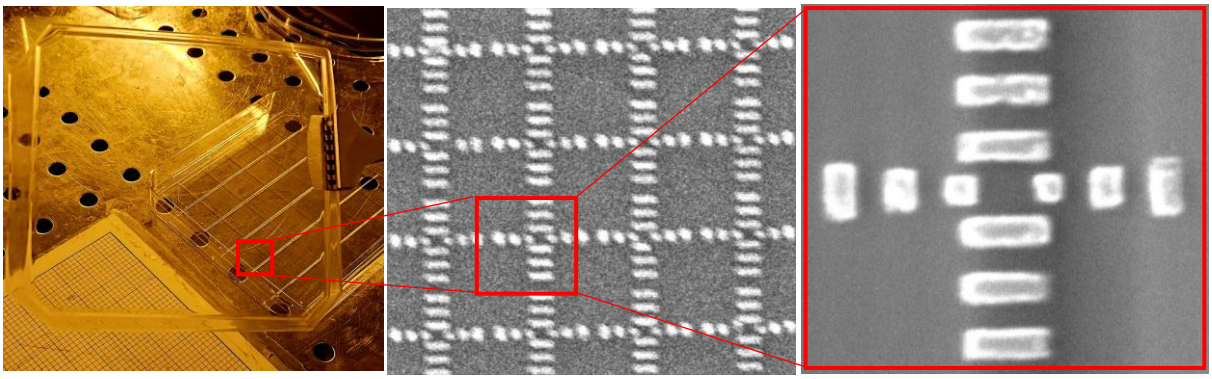

Figure 2. Images of fabricated nanoplasmonic structure