Tunability and Sensitivity of Tamm Plasmon Resonance

Kuo-Ping Chen [1,*], Che-Yuan Chang [1] and Mong-Yin Ling [1]

[1] *Institute of Imaging and Biomedical Photonics, National Chiao Tung University, 301 Gaofa 3rd Road, Tainan 711, Taiwan*

E-mail: [*]kpchen@nctu.edu.tw

A plasmon state formed at the boundary of photonic crystal and metal is experimentally testified [1]. In analogy with the electronic Tamm states formed at the boundaries of a crystal, the plasmon state is named Tamm plasmon (TP). Different from the well-known surface plasmon, the propagation constant dispersion of TP lies within the light corn. No coupling system, like prism, is required to excite the plasmon mode. In addition, both TE and TM polarized light can be employed to excited TP. Studies of TP based application and its tunability was intensively discussed [2]. However, the mechanism behind resonance wavelength (λ_{TP}) shifting and variation of energy coupling efficiency to resonance modes has been less studied. In this work, a novel approach based on admittance loci is proposed to analyze the TP resonance modes and further design the layer structure for shifting resonance wavelength and tuning the coupling efficiency [3]. Figure 1 shows the schematic diagram of TP structure, and the electric field excited by incident light at resonance wavelength. In this presentation, the advanced design of Tamm plasmon device will be demonstrated for its tunability and sensor application.

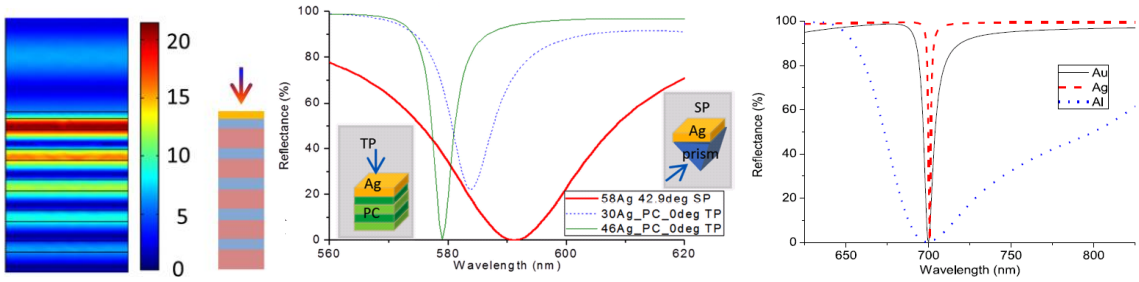

Figure 1. (Left) Electric field for TP structures and the maximum electric field can be observed near the boundary between the PC and the silver. (Middle) Comparing of Tamm plasmon and surface plasmon. (Right) Tamm plasmon resonances at 700 nm with gold, silver and aluminum.

References

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