

Fractal plasmonic metamaterials for subwavelength imaging

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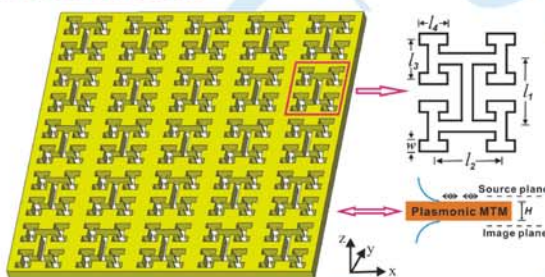
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I. Motivation

- Artificial material with *arbitrarily selected plasmon frequency*
- Plasmonic metamaterials for *all polarized SPP* without high index insersion

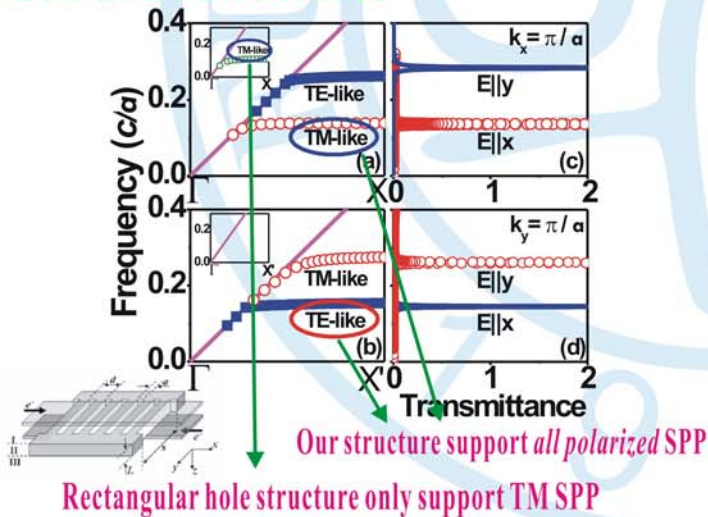
II. SPP properties of fractal plasmonic MTM

Our Structure

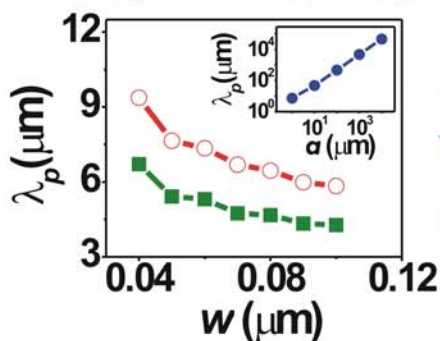


$$l_1 = l_2 = 0.5 \mu\text{m}, l_3 = l_4 = 0.25 \mu\text{m}, w = 0.06 \mu\text{m}, H = 0.5 \mu\text{m}$$

SPP band structures



Tuning SPP frequency

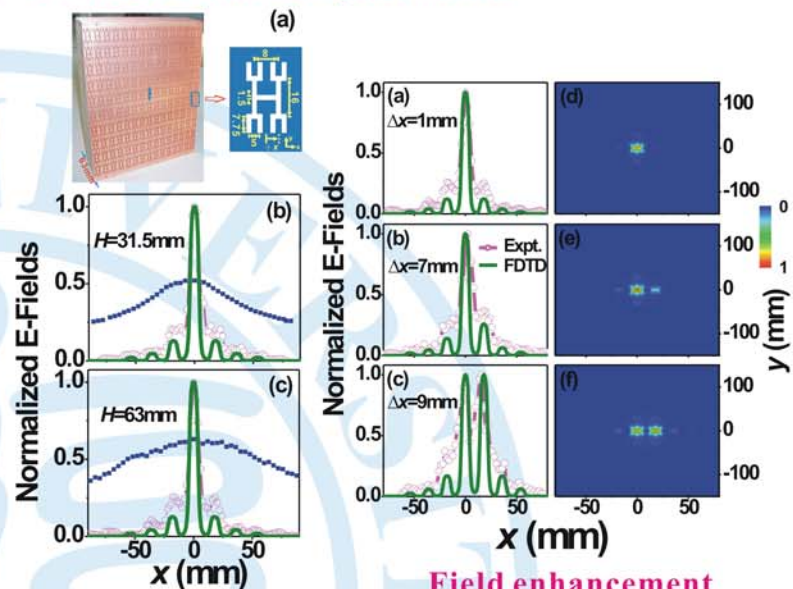


Cover entire frequency spectra!

- Level $\uparrow \Rightarrow \lambda_p \uparrow$
- Width $\uparrow \Rightarrow \lambda_p \downarrow$
- Scaling unite cell

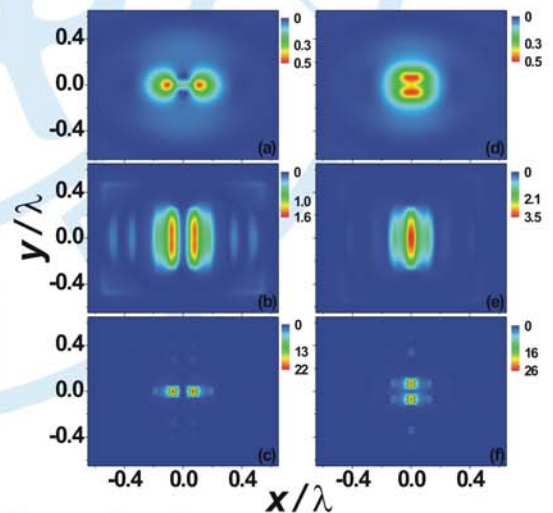
III. Super imaging with fractal plasmonic MTM

Microwave experiment



Resolution = periodicity
 Field enhancement
 Subwavelength imaging

Infrared simulations



IV. Conclusion

- Tunable SPP frequency without high index insersion
- SPP frequency independent on thickness of slab
- Subwavelength imaging with field enhancement

Experiment collaborated with Zhejiang Univ.

Huang, *et al.*, Opt. Lett. (2009), submitted.

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