

Photonic Meta Materials, Nano-scale plasmonics and Super Lens

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Abstract

Recent theory predicted a new class of meta structures made of engineered sub wavelength entities - meta “atoms” and “molecules” which enable the unprecedented electromagnetic properties that do not exist in the nature. For example, artificial plasma and artificial magnetism, and super lens that focuses far below the diffraction limit. This theory has been controversial and under hot debate over last few years. If the theory is correct and these unique properties can be realized, it will have profound impact in wide range of applications such as nano-scale imaging, nanolithography, and integrated nano photonics.

I'll discuss a few experiments that demonstrated these intriguing phenomena. We showed, for the first time, the high frequency magnetic activity at THz generated by artificially structured “meta molecule resonance”, as well as the artificial plasma. Our experiment also confirmed the key proposition of super lens theory by using surface plasmon. We indeed observed optical superlensing which breaks down so called diffraction limit. I'll also discuss nano plasmonics for imaging and bio-sensing. The surface plasmon indeed promises an exciting engineering paradigm of “x-ray wavelength at optical frequency”.

