Abstract Submitted
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Negative Index Metamaterials at Optical Frequencies: Theory and Experiment[1] E. PONIZOVSKAYA, A.M. BRATKOVSKY, Hewlett-Packard Laboratories, Palo Alto — Pafomov and Veselago showed in 1950-60s that negative refraction should occur in homogeneous media with simultaneously negative dielectric permittivity and magnetic permeability, $\epsilon < 0$, $\mu < 0$. Pendry (2000) speculated that the ideal Veselago lens can produce sub- wavelength resolution. We find a strong effect of surfaces on resolution limit and nontrivial relation of subwavelength imaging to EM "softness" of the lens [1]. We have designed the metamaterial by means of FDTD modeling, which is a stack of metallic films with periodic hole arrays separated by dielectric layers (called "fishnet", FN) to work at IR wavelengths $\lambda = 1.5 - 1.6\mu$m. The FN samples have been fabricated by nanoimprint lithography[2]. The transmission and reflectance characteristics of the samples have been measured by laser spectroscopic ellipsometry and showed unambiguously that the FN supports the "backward" waves and have overall negative index of refraction at IR frequencies. We also show that single layers of FN structure have positive index. We also address the questions of countering losses by using gain medium, limits sub-wavelength resolution, and focusing. 1. A.M. Bratkovsky, A.Cano, and A.P. Levanyuk, Appl. Phys. Lett. 87, 103507 (2005). 2. W. Wu et al., cond-mat/0610352.

[1]Experiment: W.Wu, Z.Yu, SY Wang (HPL), E.Kim (UCB)

A.M. Bratkovsky
Hewlett-Packard Laboratories, Palo Alto

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