Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Strongly anisotropic optical composites JUSTIN ELSER, Oregon State University, EVGENII NARIMANOV, Princeton University, VIKTOR PODOLSKIY, Oregon State University — We study the macroscopic electromagnetic properties of nano-structured meta-materials formed by plasmonic nanowires embedded in a dielectric host. We show that nanowires have a significant effect on the effective dielectric constant of the system even in the case when their concentration is below 15%. The effect of dielectric properties of nanowires as well as the effect of inclusion concentration, shape and local configuration disorder on effective dielectric constant is explored via numerical simulations. Further, we develop an analytical description of the effective dielectric properties of nanowire composites and study the limit of its validity. We demonstrate that it is possible to use plasmonic nanowire composites to construct strongly anisotropic low-loss optical materials. Proposed applications include polarizers, reflectors, high-energy-density nano-waveguides, and the recently discovered non-magnetic low-loss left-handed media.

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Date submitted: 30 Nov 2005 Electronic form version 1.4