

INPAC Lectures on Modern Trends in Nanoscience:

Metamaterials as Elemental Base of Nanophotonics and Platform for Modeling in Physics

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Coffee at 14:15

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Abstract

Patterning of thin metal films on the sub-wavelength scale can yield a range of functionalities invaluable for nanophotonic application. This includes mimicking properties of conventional bulk media such as anisotropy and gyrotropy, but most importantly nanoscale patterning can lead to new functionalities. This includes high-epsilon media, stop bands and narrow resonances with strong dispersion useful in optical delays. Nanostructured films can be electromagnetically “invisible”, enforce asymmetry of light’s propagation in the opposite directions, create sub-wavelength far-field concentrations of light and form the basis of coherent source of electromagnetic radiation, the “lasing spaser”.

Electromagnetic metamaterials also provide a flexible platform for mimicking and modeling a broader physical realm. Keystone physics ideas and phenomena such as Electromagnetically Induced Transparency, Bose-Einstein Condensation, the Mössbauer Effect, the Meissner Effect, parity violation in atoms and the concept of anion are among those that could be intriguingly close mimicked in classical electromagnetic meta-materials.

