Planar meta-materials for future nano-photonics devices

Vassili A. Fedotov and Nikolay I. Zheludev
Optoelectronics Research Centre, University of Southampton, Southampton SO17 1BJ, UK
e-mail: vaf@phys.soton.ac.uk

Abstract: We will give a review of our recent and ongoing research in the field of planar meta-materials, which represent a new paradigm for future photonic applications. Planar meta-materials are based on ultimately thin metal films (effectively media of "zero" dimension in the direction of light propagation), which can nevertheless strongly interact with electromagnetic radiation due to artificial sub-wavelength patterning of the films. We will show that such low-dimensional structures can demonstrate and improve functionality of the exciting optical devices based on bulk materials such as spectral filters, polarizers and polarization sensitive beam-splitters, optical rotators etc. But more importantly artificial structuring of metal films on a sub-wavelength scale enables to achieve rather exotic and intriguing electromagnetic properties not available in nature such as magnetic mirror, invisible metal, asymmetric transmission and ultra-narrow spectral response.