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Metamaterials XII

Vladimír Kuzmiak

Peter Markos

Tomasz Szoplik

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Introduction

Metamaterials structured on the subwavelength scale and their extraordinary and tunable interaction with electromagnetic waves have continued to attract interest for a few decades. After almost twenty years since the realization of 3D metamaterials new opportunities of design and fabrication of 2D functional metasurfaces for discrete phase front modifications have well advanced. Generation, properties, and applications of surface plasmon-polariton waves have been incorporated into rich plethora of light-matter interactions.

In recent years, eastern and western European SPIE conferences on metamaterials have brought together the intertwined scientific communities of metamaterials, plasmonics, and nanophotonics.

In the invited lectures the latest advances in the field of plasmonic metamaterials, hyperbolic, polar metamaterials, in analytical and numerical modeling, metasurfaces, flat optics and in applications were reviewed. The scope of this conference has widened to include topological insulators - materials which have a semiconductor interior with narrow bandgap of controlled width and a conductive surface.

Several advances in both widespread methods as well as novel concepts implemented in metamaterial-based platforms were highlighted in the conference. For example, new ways to excite surface plasmons in integrated circuits by low-energy inelastic electron tunneling [11025-1] were presented by Anatoly Zayats, who also discussed an excitation of waveguided modes, light emission and hot-electrons in electrically-driven plasmonic nanorod metamaterials. A new approach based on a local Hilbert transform to design non-Hermitian potentials generating arbitrary vector fields of directionality [11025-6] was proposed by Kestutis Staliunas. It was demonstrated that such a functionality provides a flexible new mechanism for dynamically shaping and precise control over probe fields leading to novel effects in wave dynamics. The role of the Purcell effect which manifests itself in both surface-enhanced Raman scattering and plasmon-enhanced fluorescence [11025-20] was discussed by Constantin Simovski. In the field of topological insulators the implementations of fundamental topological models in both electronic and photonic graphene-type systems [11025-7] were presented by Sylvain Lannebère. In addition, a new class of topological crystalline insulators based on IV-VI compounds [11025-11] was presented by Tomasz Story and the influence of doping on magnetic properties of 3D topological insulators [11025-12] was discussed by Agnieszka Wolos.

In terms of applications, the conference covered several interesting topics: new technological opportunities created by metamaterials in medical imaging and sensor development [11025-15] were reviewed by Stefan Enoch; metamaterials

composed of dispersed nanowire systems for managing and tuning of infrared emission [11025-2] were presented by Maria Larciprette and a review of various metamaterial-based designs for nanobiosensors, nanophotodetectors and perfect absorbers [11025-30] was given by Ekmel Ozbay.

We would like to thank to all participants and contributors to the conference who provided a lively environment for scientific discussion and collaboration, the Program Committee members, and the SPIE team who made things work.

Vladimir Kuzmiak
Peter Markos
Tomasz Szoplik