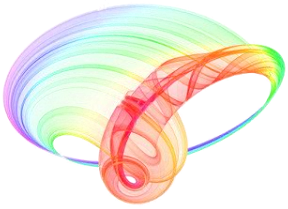
Book of abstracts



PHOTONICA2017

The Sixth International School and Conference on Photonics

& COST actions: MP1406 and MP1402

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CARDIALLY

28 August – 1 September 2017

Belgrade, Serbia

Editors

Marina Lekić and Aleksandar Krmpot

Institute of Physics Belgrade, Serbia

Belgrade, 2017

ABSTRACTS OF TUTORIAL, KEYNOTE, INVITED LECTURES, PROGRESS REPORTS AND CONTRIBUTED PAPERS

of

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Dear Colleagues, friends of photonics,

We are honored by your participation at our PHOTONICA 2017 and your contribution to the tradition of this even. It is our pleasure to host you in Belgrade and in Serbia. Welcome to the world of photonics.

The International School and Conference on Photonics- PHOTONICA, is a biennial event held in Belgrade since 2007. The first meeting in the series was called ISCOM (International School and Conference on Optics and Optical Materials), but it was later renamed to PHOTONICA to reflect more clearly the aims of the event as a forum for education of young scientists, exchanging new knowledge and ideas, and fostering collaboration between scientists working within emerging areas of photonic science and technology. A particular educational feature of the program is to enable students and young researchers to benefit from the event, by providing introductory lectures preceding most recent results in many topics covered by the regular talks. In other words, tutorial and keynote speakers will give lectures specifically designed for students and scientists starting in this field. Apart from the oral presentations PHOTONICA hosts vibrant poster sessions. A significant number of best posters will be selected and the authors will have opportunity to present their work through short oral presentations – contributed talks.

The wish of the organizers is to provide a platform for discussing new developments and concepts within various disciplines of photonics, by bringing together researchers from academia, government and industrial laboratories for scientific interaction, the showcasing of new results in the relevant fields and debate on future trends.

This PHOTONICA 2017 will include two COST Action meetings and one workshop with the main objective to promote knowledge in various disciplines of photonics. In addition, the representatives of the companies related to photonics will have significant role at the event by presenting the new trends in research and development sector.

Following the official program, the participants will also have plenty of opportunities to mix and network outside of the lecture theatre with planned free time and social events. Participating in the social program of PHOTONICA 2017, visiting the attractions of Belgrade like the Nikola Tesla museum or simply walking around the city center, the participants will have opportunity to meet Belgrade and Serbia and to learn useful facts about culture and history of the region.

This book contains 216 abstracts of all presentations at the VI International School and Conference on Photonics, PHOTONICA2017. Authors from all around the world, from all the continents, will present their work at this event. There will be five tutorial and seven keynote lectures to the benefits of students and early stage researches. The most recent results in various research fields of photonics will be presented through twenty one invited lectures and nine progress reports of early stage researchers. Within the two poster sessions and a number of contributed talks, authors will present 174 their new results in a cozy atmosphere of the building of Serbian Academy of Science and Arts.

Belgrade, July 2017

Editors

Subwavelength nickel-copper multilayers as an alternative plasmonic material

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Plasmonic materials ensure extreme concentrations and localizations of electromagnetic fields as a consequence of the appearance of evanescent waves (surface plasmons polaritons) in the range of negative values of relative dielectric permittivity near the plasma frequency [1]. The many applications of plasmonics include ultrasensitive chemical sensors, advanced all-optical devices, enhanced photodetectors, energy harvesting devices and many others [2].

Among hurdles to a more widespread use of plasmonics are a rather limited range of available plasmonic materials (usually good metals like gold and silver) and their high absorption losses in the range of interest. This is why alternative plasmonic materials are of large interest [3]. Besides using materials like transparent conductive oxides, highly doped semiconductors, intermetallic and similar, a possible approach is to combine a plasmonic material with lossless dielectric into mesoscopic or subwavelength nanocomposites (plasmonic crystals) [4], thus allowing almost arbitrary tailoring of frequency dispersion in a spectral range defined by the plasma frequency.

In this contribution we consider numerically and experimentally the use of bimetallic superlattices, i.e. all-metal plasmonic crystals consisting of two alternating materials with negative values of their relative dielectric permittivities. We use the copper-nickel multilayers. Copper is a good plasmonic material, but not widely used due to surface oxidation impairing its electromagnetic properties over time. The layers of nickel, also a plasmonic material, serve a dual purpose of being a protection against copper oxidation and ensuring formation of surface waves at the alternating interfaces between the two materials. At the same time, the multilayers serve as couplers between the propagating and the surface waves.

We simulated the electromagnetic properties of subwavelength Cu-Ni multilayers by the 2D finite element method using realistic material parameters. We adjusted the response by simply varying Cu to Ni thickness ratio. A rich optical behavior was obtained, as governed by the electromagnetic properties of the multilayers. Experimentally, we fabricated 1D plasmonic crystals consisting of alternately stacked nanocrystalline Ni and Cu layers by electrodeposition on a cold-rolled copper substrate [5]. We obtained highly parallel interfaces with thin individual strata and excellent morphology. We made use of beneficial structural properties of both Cu and Ni, while suppressing the undesirable ones. The approach offers high quality, large area, compact and low cost structures, while retaining a compatibility with the standard microfabrication and microelectronic processes.

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