

## Plasmonics

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**Abstract**—This topical issue of Photonics Letters of Poland is devoted to Plasmonics. A series of 12 papers deals both with technology, as well as pure and applied physics. The other three papers are regular contributions.

Plasmonics is alive and growing. In the recent decade the applications of surface plasmons, particularly in surface plasmon-polariton (SPP) waves, have evolved from classical metal-dielectric flat lenses and tapered-fibre metal-coated aperture probes for scanning near-field optical microscopes, through plasmonic waveguides with different sizes and shapes to sensors with advanced functionalities. The future of plasmonic innovative devices is conditioned by the reduction of losses. Ohmic losses are both material and temperature dependent. Therefore, the reduction of plasmonic signal attenuation may result from the choice of metal - which means that in the visible range silver is chosen as a plasmon vehicle. For everyday use of plasmonic devices, room temperature has to be considered as the most useful. The other source of losses is the scattering of a polariton component of SPP waves on the roughness and irregularities of a metal-dielectric interface. Scattering losses are temperature independent and can be reduced solely due to improved technology of physical vapour deposition.

In this topical issue of the Photonic Letters of Poland on Plasmonics we present a series of 12 papers which deal both with technology as well as pure and applied physics. The remaining three papers are regular contributions. The issue starts with six experimental papers. The first contribution from American-Polish authors (*Grzelak et al.*) presents fluorescence spectroscopic experiments on a plasmonic hybrid nanostructure composed of a silver island film covered with a silica layer and a light-harvesting complex, peridininchlorophyll-protein. Then goes a paper on e-beam physical vapour deposition of smooth Al nanofilms on fused silica and sapphire substrates at low temperatures (*Wróbel et al.*). In the subsequent experimental paper it is shown that resonant metallic nanostructures at the interface between two dielectrics can bend light in a controlled way, and from the measurement of bending it is possible to retrieve information on surface morphology (*Belardini et al.*). The

fourth paper describes the fabrication of semicontinuous Au films on glass substrates using a wet chemical method and their use for surface enhanced Raman scattering (*Bartosewicz et al.*). Then goes a paper on the fabrication of hybrid nanostructures composed of chemically synthesized silver nanowires and peridinin-chlorophyll-protein light-harvesting complexes from algae *Amphidinium carterae* (*Twardowska et al.*). In the subsequent paper the evolution of Ag nanoparticles size and their concentration is monitored in the space- and time-resolved measurements of laser-induced absorption in glass containing silver ions using a transient pump-probe technique (*Wolak et al.*).

The next six papers are based predominantly on analytical and numerical methods. *Babicheva and Lavrinenko* propose a plasmonic modulator on barium titanate, which can be used as a compact active device in photonic integrated circuits. Then the filtering properties of thin metal-dielectric-metal multilayer structures shown in simulations are confirmed in the experiment (*Stolarek et al.*). The subsequent paper deals with SPP waves propagating at the boundary between an isotropic medium and a semi-infinite metal-dielectric periodic medium cut normally to the layers (*Zapata-Rodríguez et al.*). In the range of frequencies, where the periodic medium shows hyperbolic space dispersion, hybridization of surface waves occurs. Surface phenomena are the subject of the next paper on monochromatic beams of surface plasmon-polaritons and their non-coherent superpositions, spectral degree of polarization and Stokes parameters (*Novitsky and Lavrinenko*). Then goes an interesting description of a mathematical tool that allows to predict a dipole localized surface plasmon resonance frequency as a function of size for gold and silver nanoparticles in water (*Derkachova and Kolwas*). In the concluding paper on media with the hyperbolic-type dispersion the properties of waves propagating in slabs of single-wall metallic carbon nanotubes tilted with respect to the slab interfaces are reported (*Hashemi et al.*).

We believe that this special issue designates important problems in the development of plasmonics and will serve as a milestone in fundamental and applied research directions.