Excitation of surface plasmon polaritons in nanostructured organic hybrid systems

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Abstract

Organic plasmonic hybrid systems are promising components for next-generation nanophotonic devices, because they can serve as active plasmonic elements in nanophotonic circuits, converting optical signals into plasmonic signals and vice versa [1]. Moreover, exchanging noble metals with recently recognized plasmonic materials (e.g. TiN), gives the opportunity to design and fabricate low cost and CMOS compatible systems, which can be utilized for plasmon generation, modulation and sensing [2].

In this work, we focus on both linear and non-linear optical properties of organic nanofibers (ONFs), namely photoluminescence and second harmonic generation, which subsequently excite surface plasmon polartion (SPP) [3][4]. Organic material transferred from the growth to a nanostructured surface, creates a system, which allows us to explore exciton-plasmon coupling.

To explore the fundamental properties of the hybrid system, we perform time-resolved photoluminescence spectroscopy, conventional reflection spectroscopy and fluorescence lifetime imaging microscopy. Furthermore we compare our experimental to numerically obtained results from finite-difference time-domain calculations. The presented studies contribute to a better understanding and control of hybrid-mode systems, which are crucial elements in future designs of low-loss photonic energy transfer devices.

Keywords: surface plasmon polaritons, organic fibers, hybrid modes, exciton-plasmon coupling, reflection spectroscopy, fluorescence lifetime imaging microscopy,

References

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