Björn M. Reinhard, J Nanomed Nanotechol 2012, 3:9
http://dx.doi.org/10.4172/2157-7439.S1.003

OMICS Group Conferences
Accelerating Scientific Discovery

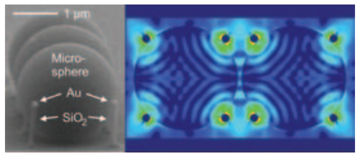
2nd International Conference on
Nanotek and Expo

December 3-5, 2012 DoubleTree by Hilton Philadelphia Center City, USA

Going beyond plasmonics: Self-assembled optoplasmonic molecules and superlenses

Björn M. Reinhard
Department of Chemistry and The Photonics Center, Boston Univeristy, USA

In this seminar I will review our recent activities in developing an on-chip integrated optoplasmonic nanocircuitry that combines the capability of optical microcavities to insulate molecule-photon systems from decohering environmental effects with the superior light nanoconcentration properties of nanoantennas. We fabricated discrete networks of optoplasmonic elements, referred to as optoplasmonic molecules, through a combination of top-down fabrication and template guided self-assembly. This approach facilitated a precise and controllable vertical and horizontal positioning of plasmonic elements relative to whispering gallery mode (WGM) microspheres. The plasmonic nanostructures were positioned at pre-defined locations in or close to the equatorial plane of the dielectric microspheres where the fields associated with the plasmonic modes can synergistically interact with the evanescent fields of the WGMs. We characterized the far-field scattering spectra of discrete optoplasmonic molecules and observed a broadening of the TE and TM modes indicative of an efficient photonic-plasmonic mode coupling between the coupled photonic modes of the WGM resonators and the localized surface plasmon modes of the NPs. Our experimental findings are supported by generalized multiple particle Mie (GMT) theory simulations, which provide additional information about the spatial distributions of the near-fields associated with the photonic-plasmonic hybrid modes in the investigated optoplasmonic molecules. The simulations reveal partial localization of the spectrally sharp hybrid modes outside of the WGM microspheres on the Au NPs where the local E-field intensity is enhanced by approximately two orders of magnitude over that of an individual Au NP. Optoplasmonic molecules amalgamate the advantages of conventional photonic and plasmonic nanomaterials and facilitate a tailoring of near- and far-field responses through photonic, plasmonic, and photonic-plasmonic mode coupling. Potential application of these materials for long-range photon transfer, light nanoconcentration, and information processing will be discussed.



SEM sideview of optoplasmonic molecules (left) and simulated n ear-field intensity distribution in an optoplasmonic dimer (right). Reproduced with permission from W. Ahn et al. ACS Nano 2011. Copyright the American Chemical Society.

Biography

Reinhard received his BS in 2000 from Technical University Munich, and his PhD in 2006 from UC Berkeley. Currently, he is an assistant professor at Department of Chemistry and The Photonics Center, Boston University. He received many presitigeous awards, including NSF Career Award, Juan de la Cierva Award, DFG Research Scholarship, Otto Wipprecht Fellowship etc.

bmr@bu.edu