Abstract Submitted
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Directional Control of Plasmon-Exciton interaction with Plexcitonic Crystals[1] SINAN BALCI, Department of Astronautical Engineering, University of Turkish Aeronautical Association, 06790 Ankara, Turkey, ERTUGRUL KARADEMIR, COSKUN KOCABAS, ATILLA AYDINLI, Department of Physics, Bilkent University, 06800 Ankara, Turkey — Plexcitons [1] are strongly coupled plasmon excitons modes. In this work, we developed a platform, consisting of one and two dimensional corrugated surface patterns coated with a thin metal film and a dye solution. This system shows a controlled coupling action based on the excitation direction of SPP modes [2]. Our scheme is based on the control of wavelengths of the forbidden SPP modes. Three kinds of patterns have been tested; a one dimensional uniform, a triangular, and a square lattice type crystals. For all three cases, lowest wavelength of the band gap is observed in Γ to M direction. For triangular and square lattice cases, band gap center oscillates between two finite values for every 60° and 90°s, respectively. We utilized this behavior to control SPP and J-aggregate coupling. We observe directional dependence of Rabi splitting energy varying between 0 meV and 60 meV . Square lattice gives the ability to tune a larger band gap, whereas triangular lattice gives higher number of symmetry points. Simulations show that, an 80 nm deep triangular lattice with 280 nm periodicity can result in omnidirectional decoupling of plexcitons.

[1] N. T. Fofang, T.-H. Park, O. Neumann, N. A. Mirin, P. Nordlander, and N. J. Halas, Nano Lett. 8, 3481 (2008).
[2] E. Karademir, S. Balci, C. Kocabas, and A. Aydinli, Opt. Express 22, 21912 (2014).

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