Editorial

Nanophotonics: Fabrications and Application of Nanoscale Optics to Novel Photonic Devices

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Nanophotonics is a generic technology that can overcome the deadlock of conventional photonics, in which the size is limited by diffraction limits of light. Based on interdisciplinary studies including condensed-matter physics, optical science, and quantum field theory, nanoscale materials and optical energy transfer at nanoscale have been extensively studied. The recent development on nanoscale optics opens up new concept of nanoscale optical theory, as an example dressed photon theory, and a variety of new phenomena have been investigated. The results of the basic research have been applied to numerous applications, including nanometer-sized photonic devices, nanoscale fabrication techniques, and highly efficient energy conversion. Here, we have invited a few papers that address the above topics.

One paper of this special issue addresses solution searching devices based on the optical near-field energy transfer between quantum dots (QDs). The results shown here indicated the possibility of controlling the spatiotemporal dynamics between multiple QDs, resulting in a higher performance of solution searching devices. Another paper reported the new type of light emitting device (LED) of silicon (Si). Even though Si is an indirect band gap material, they realized Si based LED by introducing dressed photon and phonon (DPP) assisted annealing process. Moreover, the emitting spectrum was controlled by DPP assisted annealing using a short pulse pair. One of the papers also addressed LED but based on GaP, which is also an indirect band gap semiconductor. In this paper, GaP based LED fabricated

by DPP assisted annealing process is reported. Such device has unique emitting properties depending on the annealing process. Another paper demonstrated the possibility of high-contrast switching of local surface plasmon using hybrid structure made of metallic nanorods and a phase change material. Additionally, the authors suggested the one-dimensional cellular automata algorithm using metallic nanorod and phase change material. Another paper reported the unique flattening technique made possible thanks to DPP. By using DPP etching, selective flattening of the smallest surface features is made possible, resulting in an angstrom scale ultraflat plastic substrate.

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