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EDITORIAL NOTE

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Optical Sensors and Energy Storage and Transfer using Plasmonic Nanomaterials

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Editorial

Under resonant excitation, nanoparticles such as noble metal nanomaterials and various metal oxide nanomaterials display extremely strong light-matter interactions. At targeted wavelengths, very high absorption and scattering can be obtained. Optical NPs and nanostructures have been widely exploited in a variety of sectors, including nanophotonics and analytical chemistry, due to their appealing optical features. Five original research articles are presented here, each addressing a different aspect of optical nanomaterials synthesis, an innovative optical sensor design, and energy storage. In addition, novel physical phenomena and mechanisms are described in these disciplines. Dr. S. R. Tahhan and colleagues described the creation of a fibre Bragg grating coating for refractive index sensors using TiO_2 nanostructured metal oxide. After coating the fibre with a few hundreds nanometers thick TiO_2 coating with 20 nm–50 nm hole sizes, higher shifts and narrower peaks in the Bragg wavelength were produced. The sensitivity of the sensor with TiO_2 coating is higher than that of the sensor without it. Dr. G. Zhu studied the mode structures of a multiphoton generated UV laser in a ZnO microrod. The vapor-phase transport approach was used to make hexagonal wurtzite structural ZnO microrods. The multiphoton induced ultraviolet (UV) laser was seen in a microrod under the excitation of a pulse laser with a wavelength of 1200 nm. The laser mode structures' reliance on the pump. At low pump intensity, the laser is in whispering gallery mode (WGM), while at high pump strength, it is in Fabry-Perot (FP) mode.

Dr. Q. Liu and colleagues have published another paper on the regulated growth of ZnO nanorod arrays. The seed layer of ZnO nanoflakes on Al substrates is used to create high-quality ZnO nanorod arrays. This transition is thought to be caused by the physical adsorption of water molecules on the surface of ZnO nanorod arrays, as proven by X-ray photoelectron spectroscopy.

Using the generalised gradient approximation method within the density functional theory, L. Cai and Dr. C. Feng investigated the effect of vacancy defects on the electrical structure and optical characteristics of GaN. Crystal parameters in GaN drop when there is a nitrogen vacancy (GaN:VN) and increase when there is a gallium vacancy (GaN:VG) (GaN:VGa). Defect levels are introduced at the top of the valence band by the Ga vacancy, and the defect levels are contributed by N_2p electron states. Furthermore, employing tri-butyl phosphate as a phosphor source, synthesis of $xLiMnPO_4yLi_3V2(PO_4)_3/C$ nanocomposites for lithium-ion batteries has been reported. They developed new $xLiMnPO_4yLi_3V2(PO4)_3/C$ nanocomposites, which addresses a critical issue in high-performance lithium-ion batteries.

The optical characteristics of nanoparticles is a topic that is both relevant and timely. They have been used in plasmon-enhanced spectroscopy, photocatalysis, energy storage, and solar cells, among other applications. This issue is relevant to broad study in chemistry, physics, optics, and material science, and it will pique the interest of researchers in these domains who are new to or have expertise with plasmon-enhanced applications in a variety of fields. As a result, the issue's wide potential readership will help to expedite the development of plasmon-related research and its practical applications in a variety of domains, including surface-enhanced spectroscopy, energy storage, and energy transfer.

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