Editorial for special issue on soft-matter photonics (soft mattonics)

Soft-matter photonics (soft mattonics) is an emerging and active area that has attracted widespread attention in recent years. Compared with solid materials, soft matters exhibit inherent advantages such as excellent adjustability, high flexibility, scalable size, ease of manufacture, and environmental adaptation. This special issue focuses on various interesting optical properties and fantastic photonic applications of soft matters including different liquid crystal (LC) phases, stimuli-responsive polymers, and even silks. This special issue aims to present the impressive progresses on soft mattonics and promote developments of related applications.

This special issue includes seven invited papers contributed by several active research groups on soft mattonics. Naturally derived biomaterials supply a sustainable and biocompatible approach for optical devices. Wang *et al.* reviewed the use of silk as a material platform for optics and photonics. They summarized recent advances in silk-based optical devices and discussed the challenges and directions in further investigations. This review shows us a bright future of sustainable, intelligent, wearable/implantable, and multifunctional optical devices based on natural biomaterials. Artificial microstructured materials play key roles in photonics as well. Liu *et al.* demonstrated the holographic fabrication of nanoporous polymeric distributed Bragg reflector (DBR) films via a single prism. The DBR films consist of alternative polymer-rich and air-nanopore-rich layers induced by phase separation. By changing the interfering angle of two laser beams, red–green–blue (RGB) colors were highly reflected and the reflection peaks were further tuned by filling different liquids into the pores inside the films, thus verifying the potential usage for color filters and refractive index sensors.

Among various soft matters, LCs have attracted particular attention due to their excellent controllability of self-assembly behavior and various stimulus responsivities. Li *et al.* presented the production of polymerized cholesteric LC (PCLC) microdisks based on centrifugal microfluidics. The tunable lasing properties of two dye-doped PCLC microdisks were characterized, and their potential applications in microcavity laser and optical barcode were demonstrated. Zheng *et al.* theoretically and numerically analyzed the dynamic manipulation of the helicity in a cholesteric helical superstructure. Evolutions of the oblique angle and pitch length under an electric field in the twisting and bending distortions of the cholesteric LC (CLC) heliconical superstructures were systematically calculated. It extends the understanding on a wide range tuning of reflective bands and opens new possibilities for exploring multifunctional optical devices.

Photoalignment enables the arbitrary azimuthal angle control of LCs, thus facilitating advanced photonics applications. Wei *et al.* presented an autofocusing circular Airy beam via adopting a specific LC geometric phase plate. The LC plate was carried out by a photoalignment technique. The propagation dynamics were simulated and characterized. It significantly promotes circular Airy beam related applications. Traditional LC optical devices suffer from slow electro-optical response. Guo *et al.* demonstrated diffractive optical elements with photopatterned ferroelectric LCs. The circular Dammann gratings can be switched with high efficiency in tens of microseconds, which is approximately two orders of magnitude faster than the existing response time of nematic LC devices. It paves a bright way for fast responsive diffractive optical elements. Hu *et al.* extended the working band for photopatterned LC devices and proposed a broadband and highly efficient terahertz (THz) Bessel vortex beam generator. It works on the frequency-independent geometric phase modulation induced by a specially designed inhomogeneous LC waveplate, which combines a spiral phase and a circular grating phase. Via properly predesigning the LC patterns, various topological charges may be encoded to the Bessel beam, thus upgrading the existing THz imaging and communication apparatuses.

This special issue is expected to provide a glance at the extraordinary growth in soft mattonics, which calls for more comprehensive interdisciplinary cooperation. Foreseeing the emerging new developments in the preparation of soft materials for photonic applications, the discussion on the mechanism of soft mattonics, and the demonstration of photonic elements and devices based on soft matters, we strongly encourage our colleagues working in this promising area to submit their future talented work to *Chinese Optics Letters*.

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