Carbon dot-Based Nanomaterials for Bioimaging and Biosensing

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Carbon dots (C-dots) are a new class of fluorescent carbon nanomaterials defined by their characteristic size range of 2-10 nm[1]. Due to their advanced physical and chemical properties, including ultrasmall size, excellent solvent solubility, biocompatibility, continuous and broad absorption spectra, high luminescent activity, significantly improved photostability, and environmental friendliness, C-dots have been widely used for bioimaging, drug delivery, sensing, catalysis and optoelectronic applications. The functionalities of C-dots are connected with their structures. In this work, we will demonstrate creating C-dot-based nanostructures through interactions of C-dots with soft materials and their potential applications in optics and bioimaging. In the first case, by confining C-dots into a ternary sessile microdrop, the self-assembly of C-dots was trigged by liquid-liquid phase separation in the droplet evaporation process[2]. The interactions between C-dots with droplet components lead to the rearrangement of C-dots into film, porous and granular structures. Accordingly, crystalline structures and surface defects have displayed differently, resulting in significant fluorescent emission changes. In the second case, the interactions between C-dots with several polymeric structures created biomaterial composites[3]. Compared to free C-dots, the developed C-dot nanocomposites are sensitive to environmental pH, ions and pollutants. The demonstrated approaches are versatile and controllable for generating variable carbon dot-based nanostructures with prospective applications.

References:

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