Stimulating and harnessing circularly polarized luminescence of helically assembled carbonized polymer dots via interfacial dynamics

Jiaying Lin[1], Rulin Liu[2], Peixian Chen[1], Yangfei Lv[1], Junjie Hao[3], Meijuan Chen[1], Dongxiang Zhang[1], Ruikun Pan[1], Yiwen Li[1], Xi Zhu[2], Tingchao He[4], and Jiaji Cheng[1]

[1]Hubei University
[2]Shenzhen Institute of Artificial Intelligence and Robotics for Society
[3]Southern University of Science and Technology
[4]Shenzhen University

October 24, 2022

Abstract

Stimulating and harnessing circularly polarized luminescence (CPL) is not only a *sine qua non* for fundamentally unveiling chirogenesis in physical chemistry, and also a pivotal prerequisite for implementation of such phenomenon in area of chiral optoelectronics and theranostics. Herein, red-emissive carbonized polymer dots (CPDs)-based helical structures were synthesized in this work via biomolecule-tailored organic-inorganic co-assembly strategy. The surface states related chirality exhibited enhanced circular dichroism (CD) and CPL activities with anisotropic factors as high as $g_{CD,max}$=5.4×10^{-3} and $g_{lum,max}$=1.5×10^{-2} respectively. The obtained CPL signals can be further manipulated with an excitation-dependent manner indicating a synergistic-competition phenomenon is existed between configurational chirality and intermolecular energy-transfer dynamics, which is further supported by simulations based on density function theory (DFT). Such tunable CPL behaviors triggers revolutionary designs and applications of these chiral CPDs into the realm of chirality-related biological issues and next generation chiral optoelectronics.

Hosted file

`Manuscript.docx` available at https://authorea.com/users/516632/articles/591429-stimulating-and-harnessing-circularly-polarized-luminescence-of-helically-assembled-carbonized-polymer-dots-via-interfacial-dynamics