

Abstract

# Photoactive Carbogenic Nanotracers With Remarkable Antimicrobial Properties for pH-Sensing Applications <sup>†</sup>

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**Abstract:** Carbogenic nanoparticles (also known as C-dots) constitute a new class of carbon-based materials, which are easily synthesized via thermal treatments of carbon-rich precursors. These spherical nano-emitters are composed of an amorphous core with an approximate size of below 10 nm and exhibit exquisite biocompatibility, simplicity of surface modification, excellent chemical stability and broad excitation spectra. Their exceptional photoluminescent properties are related to the dual emissive mode with the excitation-wavelength independent or dependent emission, attributed to the presence of organic fluorophores or carbogenic cores, respectively. To date, several nanomaterials have been developed to measure the intercellular pH, including fluorescent proteins, organic dyes and quantum dots. Among them, C-dots are characterized by resistance to photobleaching, good permeability and lack of toxic metal components in their structure. Moreover, these nanoemitters demonstrate excellent analytical performance in detecting heavy metals, drugs, biological molecules, poisonous reactants or explosives and thus can be applied as highly selective optical nanoproboscopes. In summary, our results demonstrate the potential to utilize biocompatible carbogenic nanotracers for an early-stage disease diagnosis as well as highlight their remarkable antimicrobial activity against *Escherichia coli* and *Staphylococcus aureus*.

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