materials proceedings

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Abstract

Photoactive Carbogenic Nanotracers With Remarkable Antimicrobial Properties for pH-Sensing Applications †

Joanna Stachowska [1,*], Ella Gibbons [1], Antonios Kelarakis [2], Marta Krysmann [1]

[1] School of Pharmacy and Biomedical Sciences, University of Central Lancashire, Preston PR1 2HE, UK; ENGibbons3@uclan.ac.uk (E.G.); MKrysmann@uclan.ac.uk (M.K.)
[2] School of Natural Sciences, University of Central Lancashire, Preston PR1 2HE, UK; AKelarakis@uclan.ac.uk
* Correspondence: JStachowska@uclan.ac.uk
† Presented at the 2nd International Online-Conference on Nanomaterials, 15–30 November 2020; Available online: https://iocn2020.sciforum.net/.

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 nanoprobes. 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*.

Keywords: fluorescent nanoparticles, antimicrobial, C-dots, optical sensors

Supplementary Materials: The following are available online at https://www.mdpi.com/2673-4605/4/1/31/s1.

Citation: Stachowska, J.; Gibbons, E.; Kelarakis, A., Krysmann, M. Photoactive Carbogenic Nanotracers With Remarkable Anti-Microbial Properties for Ph-Sensing Applications. *Mater. Proc.* **2021**, *4*, 31. https://doi.org/10.3390/IOCN2020-07856

Published: 11 November 2020