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Waste Derivitized Blue Luminescent Carbon Quantum Dots for Selenite Sensing in Water

Pooja Devi^{a,b*}, Gurvinder Kaur^{b1}, Anupma Thakur^{b1}, Navneet Kaur^c, Anita Grewal^d and Praveen Kumar^b

^aAcademy of Scientific and Innovative Research (AcSIR), Council of Scientific and Industrial Research, New Delhi, India

^bCentral Scientific Instruments Organisation, Chandigarh-160030, India

^cDepartment of Chemistry, Panjab University, Chandigarh-160014, India

^dUniversity Institute of Engineering & Technology, Kurukshetra University, Haryana, India

poojaiitr@csio.res.in

poojaiitr1987@gmail.com

*Corresponding author. Tel.: (+91) 172 2672320

Abstract:

Herein, we report an environmental friendly, facile, and completely green synthetic method for producing carbon quantum dots (CQDs) from whey, a major dairy waste. The as-prepared monodispersed diameter CQDs exhibit blue luminescence with noteworthy quantum yield (~11.4 %) and excitation dependent emission behaviour. Nuclear magnetic resonance (NMR) analysis reveals the presence of aromatized carbon peaks, leading to polymerized CQDs diameter architecture during whey pyrolysis. The X-ray and selected area electron diffraction patterns confirm their amorphous nature. Further, we demonstrate, these CQDs as an effective sensor probe for selective selenite monitoring in water upon functionalization with appropriate ligand. The functionalized GCQDs probe is shown to detect selenite with high sensitivity in 10-1000 ppb detection range. Further it is selective for selenite over other relevant ions (such as Cu^{2+} , As^{3+} , As^{5+} , Pb^{2+} , Ni^{2+} , Se^{6+} , Cl^- , Br^- , NO_3^- , NO_2^- and F^-) and displays a sub-ppb detection limit at 1.1 % relative standard deviation.

¹ These authors have contributed equally

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