Preface

Carbon nanomaterials have slowly captured interest within the scientific community and have emerged as unique functional materials within the scope of "soft matter". These materials offer unique properties that can be harnessed for new-age cutting-edge technologies. Carbon is an abundant element constituting most living matter on earth. This makes the use of carbon-constituted materials amenable for use in various technologies, biocompatibility and biodegradability being advantageous considerations. Many materials that arose with the advent of nanotechnology had tremendously exceptional qualities. In addition, they also had toxicity issues because a benign substance in bulk state can have injurious effects to health at the nanolevel. Carbon quantum dots because of their biota-friendly composition have been observed to have incredibly low toxicity which makes them perfect candidates to be harnessed in biological applications. They were accidently discovered in 2004 during the research on carbon nanotubes. Since then, they have been investigated to understand the elusive nature of the fluorescence origin. They have also found very interesting applications in the fields of biomedical engineering, drug delivery, optoelectronics and catalysis.

The motivation behind this work was to unfold the mysteries and capabilities surrounding carbon quantum dots further. I believe the research done till date on this topic is just a tip of the iceberg. Many reports on the synthesis of carbon dots are available but direct association of the impact of changing the reaction parameters on the final emission of carbon quantum dots is rather limited. The utilization of carbon dots to design simple detectors and sensors that have the possibility to reach the market is also less. Another area that is less researched upon is the controlled synthesis of metal nanoparticles using the reducing capabilities of carbon dots. This may not only make the composition living matter-friendly and less toxic but will also help in designing dual probes that can utilise the properties of both, for example surface plasmon resonane of gold nanoparticles and photoluminescence of carbon quantum dots. Carbon dots have also fully not been explored as bioimaging tools for diagnosis and detection in the affected and unaffected tissues. The spontaneous self-assembly of these graphitic materials with biomolecules is also worth probing. Answering all these unexplored directions of research pertaining to these wonderful nanoparticles is bound to clear the haze surrounding them and making this field more

lucid. This work is an attempt in this direction and is hoped to resolve some fraction of obscurity surrounding this fascinating field.