

PREFACE

The interdisciplinary amalgamation of Nanomaterial technology and Natural products may lead to development of eco-friendly nano-probes for tackling modern challenges. Carbon nanodots (CNDs) are fluorescent zero-dimensional carbon nanomaterials with a size under 10 nm. Their outstanding features, including as tunable fluorescence, high photostability, good biocompatibility, and physico-chemical properties, have attracted a lot of attention from the scientific community. All of these characteristics led to their diverse applications in various domains such as optoelectronic devices, solar cells, batteries, catalysis etc. The current thesis aims to fabricate CNDs from natural products using one-pot hydrothermal method with the goal of altering their sensing properties by surface functionalization and doping. The structure, size, surface nature, photoluminescence properties, sensing abilities are characterized by different techniques. These nanodots were also evaluated for thermal stability, colloidal dispersion stability, and photostability. The plants have been authenticated by certified taxonomist and via DNA fingerprinting technique. The fabrication methods, structure, properties and potential applications of these CNDs have been summarized in different chapters.

The entire thesis is divided into eight chapters. **Chapter 1** deals with introduction of different CNDs with different synthetic routes and their applications. We have also discussed the literature review on natural products-derived CNDs and their significance. In this chapter, we have underlined our motivation to undertake this work. **Chapter 2** deals with the rationale and the proposed objectives of research work. **Chapter 3** deals with materials and methods used in various studies. **Chapter 4** illustrates a simple and green synthetic approach to fabricate blue fluorescent CNDs from aqueous extract of *Andrographis paniculata* leaves and their various healthcare applications. **Chapter 5**

deals with a simple and green synthetic approach to fabricate pink fluorescent CNDs from ethanolic extract of *Andrographis paniculata* leaves and their various healthcare applications. **Chapter 6** illustrates fabrication of fluorescent bluish-green CNDs using *Asparagus racemosus* via facile one-step hydrothermal carbonization approach and their various healthcare applications. **Chapter 7** illustrates quercetin-derived CNDs and their application in sensing metal ions, drug delivery, cytotoxicity, antibacterial against MDR strains, free radical sensing-scavenging activity. **Chapter 8** deals with summary and conclusions of this work.

Thus, our findings suggest the potential of natural products-derived carbon nanodots for wide healthcare applications.

