



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

The research works presented in this thesis focuses on design, synthesis, and development CP-based optical and electrical sensors for detection of various biological and environmental important analytes with the major aim of overcoming the problem and challenges associated with existing sensing systems. Various novel CPs are rationally designed and successfully implemented as rapid, highly sensitive, and portable systems for on-field monitoring of toxic gases, food additives, disease biomarkers, and pathogens. The content of this present thesis entitled “**Design and Development of Optical and Electrical Transducers based on π -Conjugated Polymers**” is divided into five chapters. Chapter 1 gives a brief introduction about the respective research area where the scope and significance of the subsequent chapters are discussed. Chapter 2 describes the synthesis of cationic conjugated polyelectrolyte PFBT-MI which is applied for ratiometric detection and wash-free imaging of bacteria, and explored its antibacterial applications. Chapter 3 discusses the synthesis of an amine-functionalized conjugated polymer PFPDA and its application in the detection of lethal nerve agent vapor by developing a low-cost electrical sensor. Chapter 3 also highlights the development of an electronic model for rapid onsite detection of nerve agent mimic vapor by bright visual alerts from a light-emitting diode (LED) and a loud alarm signal. Chapter 4 discusses the synthesis of anionic conjugated polyelectrolyte PFPS for rapid and point-of-care testing of the neurotransmitter serotonin in physiological conditions using a smartphone-based system. Chapter 5 describes the synthesis of AIEE active conjugated polyelectrolyte PFTT-D and its application in the detection of multicolor artificial food dyes in solution.