



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : **Ph.D.**
Thesis Title: **Design and Development of Two Terminal Electrical Devices for Lighting and Sensing**
Name of Thesis Supervisor(s) : **Prof. Prameswar K. Iyer**
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SHORT ABSTRACT

The content of thesis entitled "Design and Development of Two Terminal Electrical Devices for Lighting and Sensing" is divided into five chapters. The Chapter1 describes, the introduction and provides a detailed exploration of Perovskite Light Emitting Diodes (PeLEDs) and two-terminal electrical polymer sensors, outlining their fundamentals, working principle, and device parameters, in the subsequent chapters. The Chapter 2 discussed the stable MAPbBr₃-based Perovskite LEDs (PeLEDs) with high brightness fabricated by strategically selecting the Hole Transport Layer (HTL) for efficient hole injection and charge balance in the emissive layer. The crucial effects of hole injection barrier and the hole transport properties of different HTLs on the charge transport, luminescence and current efficiency are discussed. The Chapter 3 discussed the simple method by using PEDOT: PSS and NPD as dual HTLs, to demonstrate a high efficiency PeLED based on PEDOT: PSS/NPD. Through careful dual HTL selection, high brightness PeLEDs based on MAPbBr₃ were fabricated, enabling efficient hole injection and charge balance in the emissive layer. The Chapter 4 discussed the fabrication of PFIM polymer based electrical ammonia sensor with lithography technique that was sensitive as ammonia sensor capable of detecting minute concentrations (LOD) down to 87.3 parts per billion (ppb) at room temperature. This sensor's selectivity, robustness, remarkable response (%) when detecting ammonia, and efficacy in this specific application with mathematical modelling is included. The final Chapter 5 discussed fabrication and characterization of printed electrical CO sensor with good transient response, capable of detecting (LOD) 0.047 parts per billion (ppb) at room temperature with mathematical modelling.