INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Controlled Growth of Organo-Metal Halide Perovskite Quantum Dots and Two dimensional Nanosheets for Blue Light Emission and Photodetection

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SHORT ABSTRACT

The present thesis focuses on the systematic growth of various dimensional perovskite quantum dots (QDs) and their application for blue light emission and photodetector applications. The complete thesis work is presented in seven chapters. The complete thesis work is presented in seven chapters. Chapter 1 presented a summary of the various dimensional halide perovskite materials including latest developments, key properties, doping strategies and their promising applications. Chapter 2 presents the growth kinetics and scaling behavior of vacuum deposited $CH_3NH_3PbBr_3$ thin film on various substrates and correlation of scaling exponents with its microstructural and optical properties. Chapter 3 presents novel synthetic route for the template-assisted growth of size tunable perovskite QDs and its optical tunability through quantitative analysis. Chapter 4 discusses a novel, highly reproducible and facile solvothermal route to synthesize and tailor the thickness and optical band gap of organic −inorganic halide perovskite nanosheets (NSs) and its application as light converter and photodetector. In Chapter 5, we demonstrate a novel strategy to achieve stable and deep blue emission with absolute unity photoluminescence quantum yield (PL QY) through Ce^{3+} and Tb^{3+} doping at high concentration in 2D $CH_3NH_3PbBr_3$ NS using a solvothermal method. The effect of Ce/Tb dopants in the electronic structure of the 2D perovskite is investigated using density functional theory based calculations to reveal the origin of large blue shift and high PL QY in the doped NSs. Chapter 6 presents europium doped 2D layered mixed halide perovskite NS self-biased, stable photodetector. Chapter 7 summarizes the major findings and important conclusions of the present thesis and future directions of work.