INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study	:	Ph.D.

Thesis Title: **Design Aspects of n-type Metal Oxide Based Photoanodes for Electrochemical Performance**

Name of Thesis Supervisor(s)	:	**Prof. Mohammad Qureshi**
Thesis Submitted to the Department	:	**Chemistry**
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Key words for description of Thesis Work	:	**Photoelectrochemical Water Oxidation, Metal Dopant, Hole Extractor, Co-catalyst, Heterojunction.**

SHORT ABSTRACT

My PhD research primarily focused on the different strategies and methodologies employed for the development of an efficient photo-electrocatalyst for enhanced water oxidation performances. The semiconductor materials (photoanodes) were mainly synthesized by hydrothermal and/or electrodeposition methods. The working electrodes were utilized for photoelectrochemical analysis in neutral medium electrolyte.

The chosen metal oxide based photoanodes for water splitting were WO_3 and $BiVO_4$. The monoclinic WO_3 nanoblocks were synthesized directly over fluorine doped tin oxide (FTO) substrate without the aid of any seed layer, whereas the monoclinic $BiVO_4$ photoanodes were synthesized by electrodeposition method. The electronic structure modulation of WO_3 was carried out by the In^{3+} metal doping for high carrier density. The modification of WO_3 with hexagonal boron nitride quantum dots (h-BNQDs) was demonstrated to improve the photogenerated electron−hole separation and additionally to hinder the charge recombination process. The type-II heterojunction based electrostatic attraction between PNDs and BDs was introduced for WO_3 based PEC water oxidation application. The boron nitride nanoplatelets (BNNPs) hole extractor was inserted in between $BiVO_4$ semiconductor and CoCr-layered double hydroxides (CoCr-LDH) surface oxygen evolution catalyst for amplified photoelectrochemical water oxidation performance.