



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

Name of the Student : VISHNU PRIYAN V

Roll Number : 196106029

Programme of Study : Ph.D.

Thesis Title: **Enhancing Water Quality through Adsorptive Removal of Contaminants of Emerging Concern using Bio-based Engineered Adsorbents: Modeling and Toxicological Evaluation**

Name of Thesis Supervisor(s) : Dr. Selvaraju Narayanasamy

Thesis Submitted to the Department/ Center : Biosciences and Bioengineering (BSBE)

Date of completion of Thesis Viva-Voce Exam : 03.05.2024

Key words for description of Thesis Work : Water quality, adsorption, contaminants of emerging concern, adsorbents, toxicology, modeling

---

**SHORT ABSTRACT**

Rapid industrialization and urbanization cause tremendous stress on the natural resources which leads to severe ecological impacts, amongst water is the foremost concern that can be easily polluted by contaminants of emerging concern (CECs). The persistence and/or pseudo-persistence nature of these pollutants could cause various environmental and health impacts on water ecosystems and living beings. Thereby, sequestration of these contaminants from the water systems is mandatory. So, adsorption is the prominent approach for the sequestration of these contaminants due to its efficiency at lower pollutant concentration, easy implementation, cost-effective, selectivity, and economic feasibility. The research focuses on the development and characterization of bio-based engineered adsorbents derived from bio-based precursors. These adsorbents are designed to possess high surface area and tailored surface chemistry to efficiently capture CECs from water sources. Furthermore, the thesis integrates mathematical modeling techniques to predict the adsorption behavior of CECs onto bio-based adsorbents under different scenarios. This modeling approach facilitates the optimization of adsorption processes and provides insights into the mechanisms governing pollutant removal. In addition to assessing the adsorption efficiency, the thesis evaluates the potential toxicological implications of using bio-based adsorbents for CEC removal. Toxicological evaluations encompass the analysis of adsorbent leachates and the assessment of any adverse effects on model organisms. Overall, this interdisciplinary study contributes to the advancement of sustainable water treatment technologies by offering insights into the efficacy, mechanisms, and environmental implications of using bio-based engineered adsorbents for the removal of CECs. The findings hold significant implications for water resource management and public health protection in the face of emerging contaminants.