INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Development of biomass-derived surface-modified carbon and polymer-based adsorbents for adsorptive elimination of organic and inorganic pollutants from aqueous setups

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SHORT ABSTRACT

The present era of industrialization and anthropogenic exploitation has depleted the natural resources and polluted the related ecosystems and habitats. Various biotic and abiotic methods have been exploited over the years, yet we are far from any prominent solution. Adsorption is one such competent method due to its ease of operation, effectivity in dilute systems, economic scalability and non-formation of any toxic by-products. Although adsorption is versatile and easy to adopt in practical forms, the adsorbent materials used are costly and cannot be easily regenerated and recycled, resulting in their large-scale production; thus, limiting its acceptance as an ideal wastewater remediation process. There is an urge to mitigate the problems related to bio- remediation/adsorption of industrial wastes via designing cheap, reusable, environment friendly and above all, highly efficient adsorbents.

Biomass-derived carbonaceous adsorbents are preferred for wastewater treatment and remediation due to their extended surface area, porous structure, high adsorptive capacity and a high degree of surface reactivity. However, such carbonaceous adsorbents have their own limitations, making them less susceptible and dispersive in an aqueous medium, and thus, this affects their uptake capabilities and thus limit their applicability in water remediation. Thus, to enhance its efficiency in water remediation, the carbonaceous adsorbents have been surface modified/functionalized using various agents, viz. chelating agents like Ethylenediaminetetraacetic acid (EDTA), surfactant like Cetyltrimethylammonium bromide (CTAB), and polymer-like polypyrrole. Each surface modification serves a specific purpose to the carbonaceous adsorbents for their efficient and effective action for a varying grade of pollutants.

Simultaneously, biopolymers like chitosan are also extensively exploited in water remediation. However, chitosan has been deemed ineffective in wastewater remediation due to low porosity and specific surface area in flaked and powdered forms. One such modification is the development of porous fabricated chitosan via gelation method using $CaBr_2.xH_2O$/methanol solution.

Current work proposes the design of the adsorbents as mentioned above, their characterization and their other related studies to understand its efficiency against pollutants like heavy metals, azo anionic dyes and emerging pharmaceutical contaminants like antibiotics.