

# Agricultural Waste Assessment as Adsorbents for the Removal of Pollutants from Industrial Effluents

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## ABSTRACT

All around the globe, agro-residues are widely accessible and present a disposal challenge after harvest. Industrial effluents from various chemical industries have organic and heavy metal pollutants. Because of the presence of carbon in high percentages in agricultural residues, they may be considered effective adsorbents for removing phenol, paints, dyes, cadmium, copper, zinc, chromium, lead, mercury, and nickel. The pollutants are non-biodegradable and cause health hazards. Additionally, the literature reports various technologies, namely electrolysis, reverse osmosis, flotations, ion exchange, and coagulations. However, adsorption is one of the most popular and economical methods. Agricultural wastes having high cellulose content have been reported to have a high biosorption capacity. Rice-husk, lantana camera, acacia nilotica branches (babool), bagasse, rice-straw, walnut shells, and groundnut shell abundantly available in India are found to have good adsorption capacity, especially for cadmium, chromium, lead, and phenol.

The paper describes the importance of characterizing agricultural wastes before their selection as a suitable adsorbent for a specific purpose. The characterization described is in terms of ash and fixed carbon contents, methylene blue test value, iodine number, and BET surface area. Thermo-chemical treatments are given to enhance their BET surface area. Effects of various adsorbent parameters, namely adsorbent dosage, pH of the adsorbent-adsorbate slurry, initial adsorbate concentration, agitation speed of the adsorbate-adsorbent system, and the time of contact of adsorbate with the adsorbent are explored. The mechanisms of the adsorption process are investigated using equilibrium and kinetic studies. The feasibility of the adsorption process is best studied with the help of thermodynamic analysis of the adsorbate-adsorbent system. Various methods for regenerating adsorbents have been addressed for their best utilization. Future research needs concerning the adsorption methods are also discussed.

**Keywords:** Adsorption, Agricultural wastes, Industrial effluents, Environment.

