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Evaluating Sawdust as a Bio-Adsorbent for Oily Wastewater Treatment

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Abstract:

Industries release wastewater containing dyes, which pollute water and harm living organisms. These dyes are toxic and difficult to remove. Activated carbon is effective for dye removal, but it is costly and hard to reuse. Therefore, low-cost alternatives are needed. Sawdust is a waste material obtained from wood industries. It is cheap, easily available, and eco-friendly. Sawdust can absorb dyes from water due to its natural structure. This study discusses the use of sawdust as an adsorbent for dye removal. Factors such as pH, contact time, and dye concentration affect dye removal. Overall, sawdust is a simple, low-cost, and effective material for treating dye wastewater.

Introduction

Oily wastewater is produced from activities like workshops, garages, industries, and kitchens. If it is not treated properly, it can pollute rivers, soil, and harm aquatic life. Sawdust is an easily available, low-cost waste material from wood processing. It has tiny pores that can trap oil, making it a useful natural adsorbent. This project studies how effective sawdust is in removing oil from wastewater.

Aim

To test and evaluate how well sawdust can remove oil from contaminated wastewater.

Need of the Study

Oily wastewater is harmful to the environment.

Many treatment methods are expensive.

Sawdust is cheap, natural, and widely available.

Using sawdust helps recycle waste materials.

Scope

Testing sawdust as an adsorbent in a laboratory setup.

Measuring oil removal efficiency.

Observing factors like amount of sawdust used and contact time.

Recommending sawdust as a simple option for small-scale wastewater treatment.

Literature Review

Adegoke et al. (2022) reported that sawdust-based adsorbents can remove a wide range of pollutants from wastewater, showing adsorption capacities of **10–667.9 mg/g** for emerging contaminants, **69–372 mg/g** for pesticides, **3.4–526 mg/g** for dyes, and **2.8–325 mg/g** for heavy metals, proving sawdust is a low-cost and effective bio-adsorbent.

Chikri et al. (2020) reported that sawdust is a cheap, abundant lignocellulosic material containing 35–60% cellulose and 15–30% lignin, and can remove dyes from wastewater with capacities ranging from 3.4 to 526 mg/g.

Matos et al. (2011) showed that sawdust from Algarroba wood can be converted into activated carbon with very high surface area (up to **1167 m²/g**) and ultramicropores (as small as **5–7 Å**) by heating at **800–900°C**, proving waste biomass is an effective low-cost source for high-performance adsorbent materials.

Ahsan et al. (2018) studied **sulfonated sawdust (SD-SO_3H)** as an adsorbent for removing antibiotics (tetracycline, sulfamethoxazole) and BPA from contaminated pharmaceutical/industrial wastewater, showing very high capacities of **270 mg/g (TC)**, **295 mg/g (SMX)** and **263 mg/g (BPA)**, which outperform most commercial activated carbons.

Summary

From the reviewed literature, it is evident that sawdust is a promising low-cost and eco-friendly material for wastewater treatment. Many researchers have reported that raw and chemically modified sawdust can effectively remove a wide range of pollutants such as oils, dyes, heavy metals, and organic contaminants from contaminated water.

Methodology

Collect sawdust

Sieve sawdust to uniform size

Wash with distilled water

Dry sawdust

(Optional) Apply chemical treatment – NaOH, H_2O_2, HCl

Dry treated sawdust

Prepare or collected oily wastewater sample

Add measured sawdust into oily wastewater

Allow contact time (30–90 minutes)

Remove sawdust from wastewater

Measure oil absorbed (weight difference)

Dispose or regenerate sawdust (squeezing/washing)

Conclusion

Sawdust can be an effective, low-cost, and eco-friendly material for treating oily wastewater. It reduces oil content significantly and can be used as a simple solution for small industries and local workshops. This study supports the idea of using natural waste materials for environmental protection.

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