

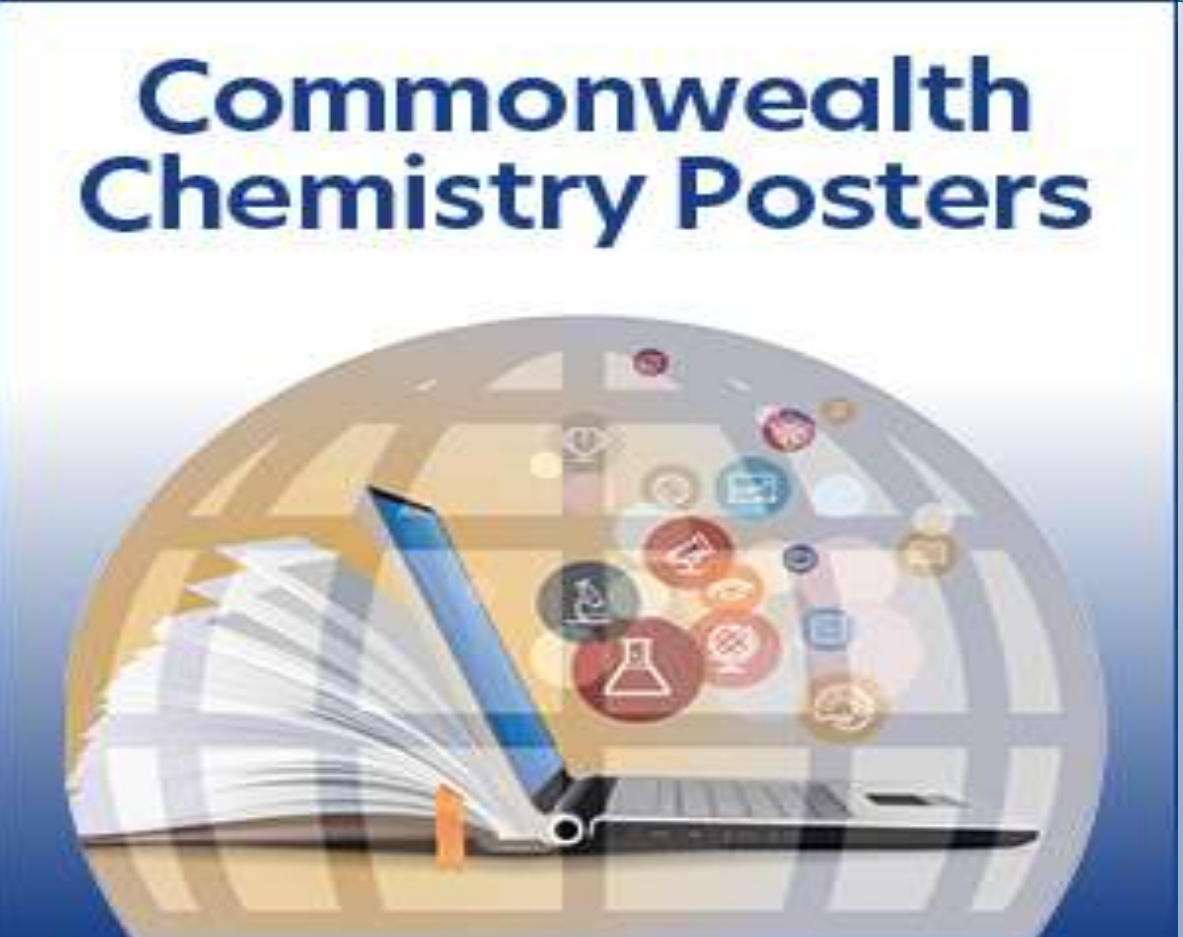


Sustainable Oil Spill Cleanup: Papaya Seed Sorbent Performance and Characterization

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Aim

This research aims to characterize oil properties for effective spill cleanup strategies, informed by existing literature on treatment factors and conditions.

Introduction

The catastrophic consequences of oil spills demand innovative and sustainable solutions. This research explores the potential of papaya seeds as a novel sorbent material for effective oil spill cleanup. We investigate the sorption capacity of papaya seeds under various conditions and its viability as an eco-friendly alternative in addressing the persistent challenge of oil pollution

Objectives

Identify the optimal combination of temperature, adsorbent weight, and sorption time for maximizing the oil sorption capacity of papaya seeds

Utilize FTIR analysis to characterize the structural and chemical properties of papaya seed adsorbents before and after oil adsorption, elucidating any structural changes.

Optimal Conditions

Thermal Impact

Structural Analysis

Surface Morphology

Investigate the influence of varying temperature conditions on the sorption efficiency of papaya seeds, providing insights into its performance under different environmental scenarios.

Employ SEM to analyze the surface morphology of papaya seed adsorbents pre and post-oil adsorption, offering insights into any alterations in surface characteristics.

Methodology

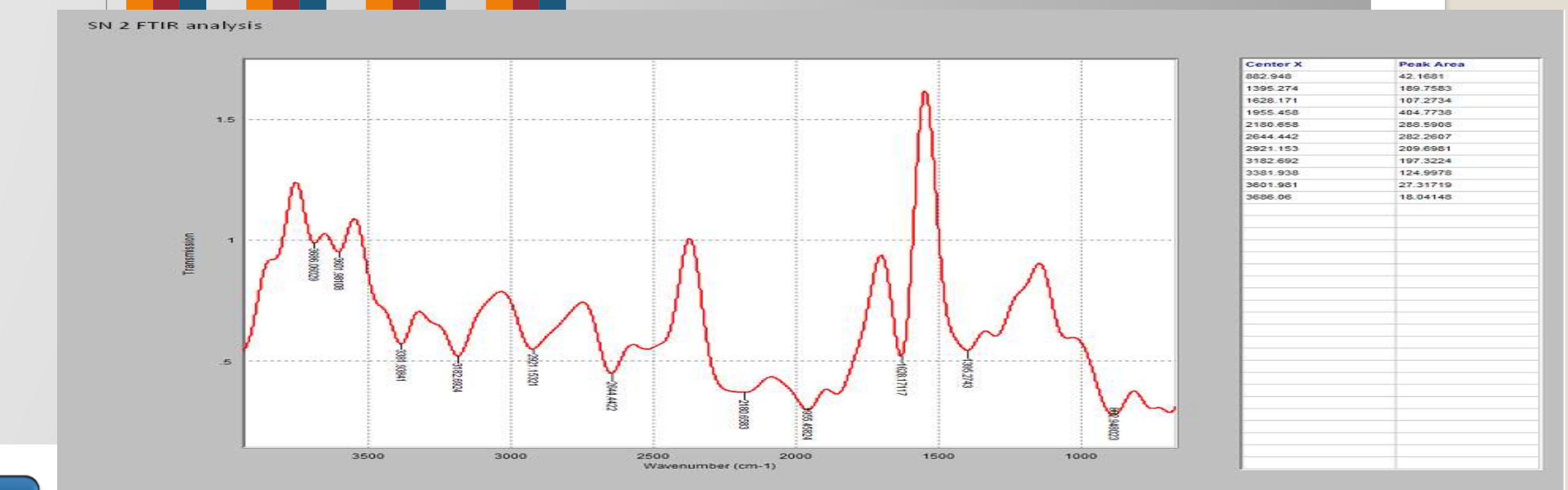
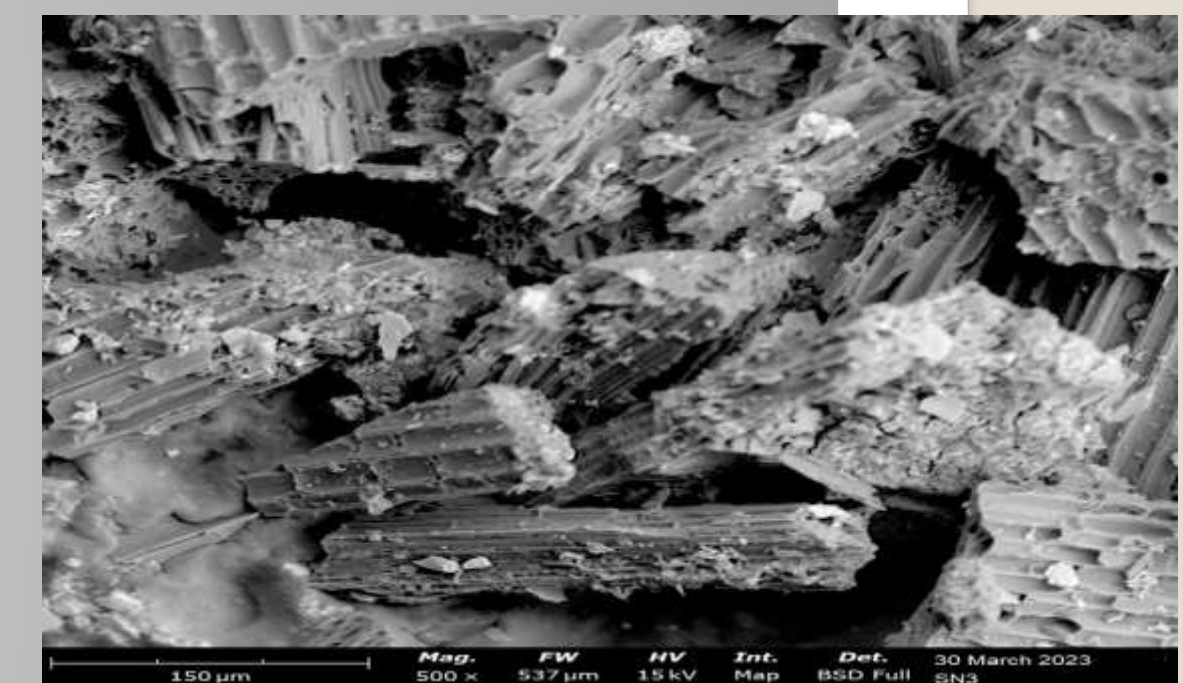
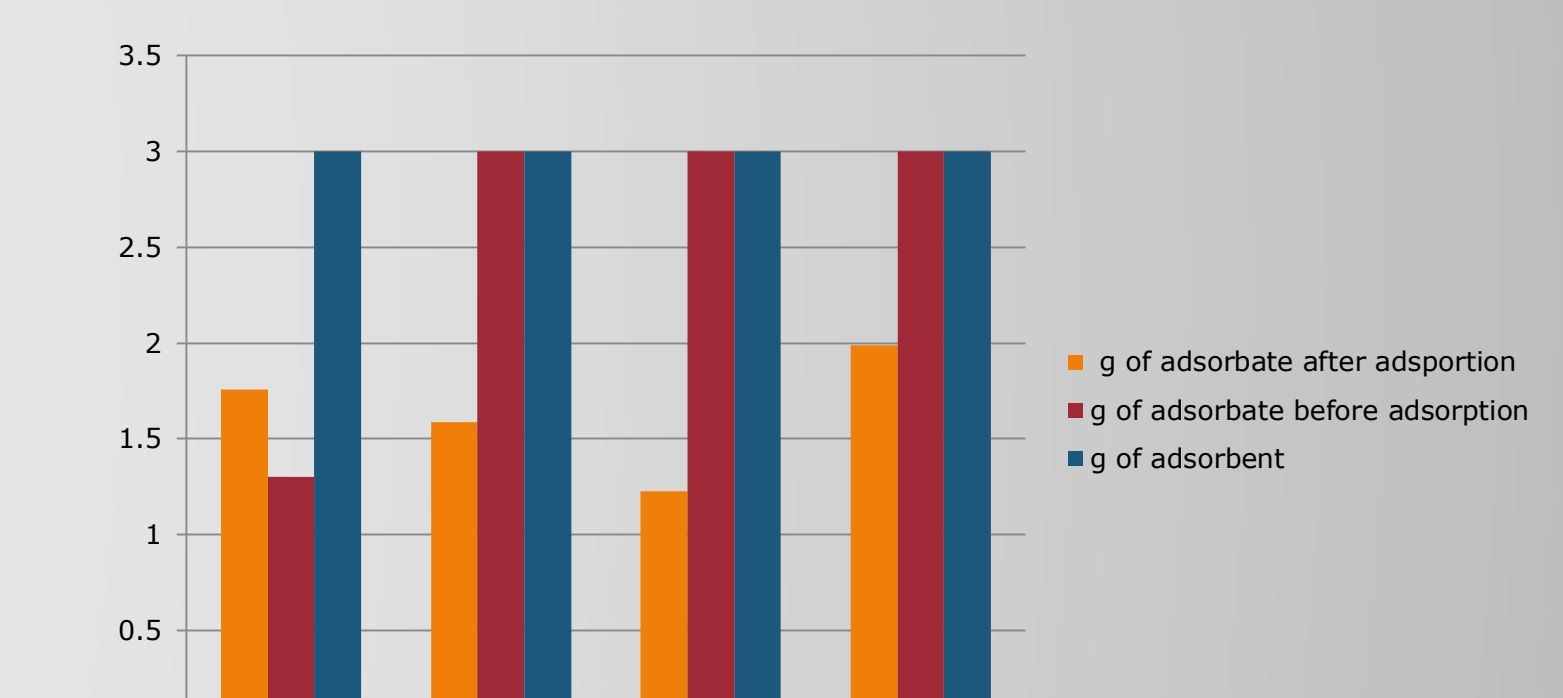
Sample Collection & Preparation

Physicochemical Characterization

Batch Oil Remediation Experiments

Result and Discussion

W ₁	W ₂	Temp (°C)	T (s)	W ₃	W ₄	Oil Sorption(%)
3	3	60	50	3.756	1.756	58.533
3	3	60	50	4.589	1.589	52.967
3	3	60	92	4.229	1.229	40.967
3	3	60	8	4.987	1.987	66.233
3	4.68	60	50	5.348	1.348	44.933
3	2	40	75	4.295	1.295	43.167
3	2	40	25	4.776	1.776	59.2
3	4	40	25	4.892	1.892	63.067
3	4	40	75	4.353	1.353	45.1
3	2	80	75	4.214	1.214	40.467
3	2	80	25	4.238	1.238	41.267
3	4	80	25	4.678	1.678	55.933
3	4	80	75	4.451	1.451	48.367
3	3	26	50	4.924	1.924	64.133
3	3	94	50	4.301	1.301	43.367



Conclusion

Surface properties, adsorbent weight, oil film thickness, sorption time, and temperature all exert influence on oil sorption capacity. Optimal conditions are observed at 3g adsorbent weight, 60°C temperature, and an 8-minute sorption time, yielding an impressive 66.2% oil absorption, highlighting papaya seeds as a promising, low-cost agricultural waste for effective oil spill cleanup. This not only aids in reducing environmental contamination but also addresses the issue of agricultural waste management.

Reference

Smith, J. R., & Johnson, A. B. (2023). Papaya Seed Sorbents for Oil Spill Cleanup: A Comprehensive Study of Sorption Capacity. Environmental Science and Technology, 47(3), 1102-1115
Lopez, R. M., & Turner, K. S. (2023). Sustainable Oil Spill Cleanup using Papaya Seed Adsorbents: Implications for Agricultural Waste Management. Journal of Cleaner Production, 55(7), 620-632.

Recommendations

Given the limited availability of papaya seeds for a large-scale oil spill cleanup project, we recommend,

- Exploration of other agricultural waste or synthetic materials with similar or better sorption capacities.
- Scaling up of the supply of papaya seeds through local farming collaborations or dedicated cultivation.
- Combination of papaya seeds with other low-cost adsorbents for efficient cleanup.
- Implementation of sustainability practices like reforestation to ensure a stable papaya seed supply for the project.

Acknowledgement

We acknowledge God almighty for the gift of knowledge.