

The Significance of Cellulose Aerogel in oil Adsorption from PWW and its Effect on oil Viscosity

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Abstract:

This study investigates the use of cellulose aerogel, derived from agricultural waste, as a sustainable solution for removing oil from produced wastewater (PWW) generated during oil extraction. Conventional oil removal methods are often inefficient and expensive, whereas cellulose aerogel demonstrated a high crude oil absorption capacity of 24.4 g/g more than double that of polypropylene fibers (≈ 10 g/g). Scanning Electron Microscopy (SEM) revealed a highly porous structure with 97.3% porosity, enabling efficient oil uptake. Viscosity testing showed a significant reduction in the viscosity of oil contaminated water, from 42 Pa·s to 0.0027 Pa·s at 60°C, facilitating improved oil recovery. The aerogel maintained 85% of its performance after five reuse cycles and reached saturation within 20 minutes, confirming its rapid and reusable nature. These findings highlight the potential of cellulose aerogel as an effective and environmentally friendly alternative for oil pollution remediation. Further research is recommended to assess its scalability and performance in real-world applications.

Keywords:

Cellulose Aerogel, Oil Adsorption, Wastewater Treatment, Nanocellulose, Environmental Remediation.