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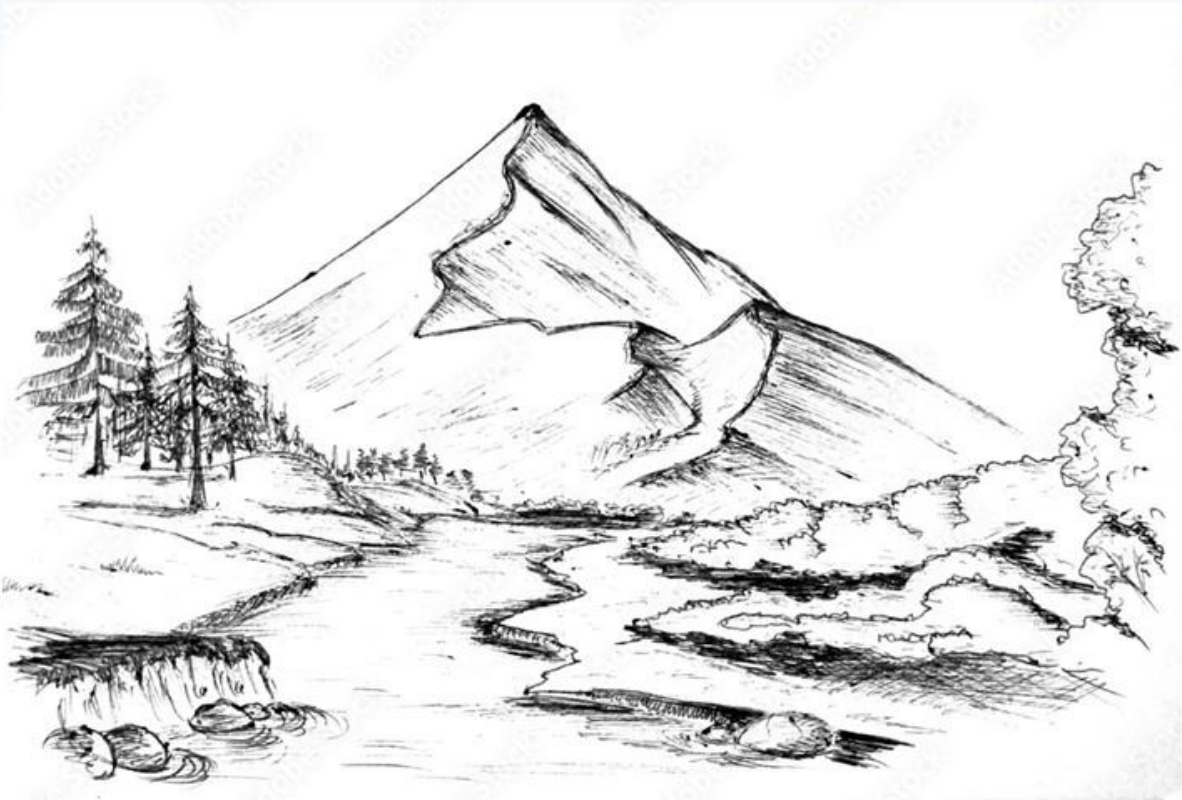

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PART II: SELECTED FULL PAPERS

Surface Modification of Balsa Wood for Functional Oil/Water Separation

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Abstract

The ecological environment is in danger due to severe pollution brought on by industrial emissions and oil spills, which are global problems. This article has been dedicated to developing effective and eco-friendly approaches for separation of oil–water mixtures. Inspiration from the tubular porosity and hierarchical organization of wood, a mesoporous, and hydrophobic three-dimensional wood structure is developed for selective oil/water separation. Nanostructured wood with naturally aligned cellulose microfibrils, cell wall nanoporosity, and precisely tuned composition has opened up numerous possibilities for advanced design of functional materials.

In the current study, balsa wood was modified in just two steps: delignification and liquid phase imbibition, to acquire simultaneously hydrophobic and oleophilic qualities. According conventional wisdom, hydrophobic surfaces exhibit underwater lipophicility while hydrophilic surfaces do the opposite. Here, from a chemical point of view, a lignocellulosic fiber surface with hydrophobic characteristics was successfully fabricated by the strategically adjusted condensation of acetone and epoxy. The morphology and characteristics of epoxy-wood were characterized by FT-IR, SEM, and the oil/water contact angles.

Keyword: epoxy-wood biocomposite, deligninfied, oil/water separation, hydrophobicity

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1. Introduction

The deterioration of the global environment and ecosystems caused by oily waste water has become extremely serious problems as industries continue to develop, and there is now increased interest in oil/water separation for dealing with industrial oily wastewater (Hou et al., 2015; Parbat et al. 2020). For example, oil spills and emissions are common during the extraction, transportation, drilling, processing, and use of oil, posing a severe danger to environmental and ecological security. Numerous oil/water separation methods, such as fencing, skimming, burning, absorbing, and distributing via various physical or chemical tactics, have been described to address these difficulties (Zhan et al, 2019; Dai et al, 2019). Furthermore, various materials such as foams, sponges, and fabrics have been produced to deal with situations. However, these methods can only produce limited oil/water separation since they often absorb both water and oil, resulting in poor separation selectivity or absorption ability. Additionally, traditional oil/water separation materials have a great difficulty resisting oil contamination, and the majority of the materials are often disposable. The burning of oil-absorbing materials frequently causes secondary pollution of the air and soil as a result (Ge et al. 2016, Kleindienst et al. 2015). To treat with oily wastewater, it is necessary to develop economic, environmentally friendly, and recyclable materials as well as