The Synthesis of High Oil Affinity Ester Macro Molecule with Renewable Resources

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Oil spillage in the sea is one of the most serious environmental disasters on our planet. Cleaning up oil spillages is a long and difficult process and if not carried out effectively irreversible damages to our eco-system may result. In this research, an effective oil absorbent material is synthesized which is based on the lipase-catalyzed esterification process. In this research, macro-molecule ester with high oil affinity was synthesized with sucrose and coconut juice. The coconut juice contained lipase which was the catalyst for the esterification. Fatty acid was prepared in-situ from the hydrolysis of catalyst both for hydrolysis and esterification. The reaction took place at room temperature since lipase is a highly stable enzyme which remains active even under unfavorable conditions. To further increase the molecular mass of the ester, lemon juice was introduced as the citric acid from lemon acted as the cross-linker since it contained three carboxylic groups and a hydroxyl group. The process of this research was environmentally friendly and sustainable as all the reactants were from renewable resources. The optimum ratio of the reactants was found to be 40g of octanoic acid: 20g sucrose: 1g citric acid: 1g lipase synthesized in temperature of 40 degrees Celsius. The macro-molecule ester synthesized can act as phase selective gelator. At room temperature, it forms a gel selectively with organic liquids, including crude oil. Oil can then be recovered from the gel phase by distillation or centrifugation. The efficiency of oil recovery of the ester was found to be 5 times the volume of ester. The properties make this material of interest for use in oil spills and industrial oil treatment processes.

Awards Won:
Third Award of $1,000