

Synthesis and Characterisation of Bio-Based Acetals Derived from Eucalyptus Oil

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Abstract : Green chemistry focuses on synthesis which has a low negative impact on the environment. This research focuses on synthesizing novel compounds from an all-natural Eucalyptus citriodora oil. Eight novel plasticizer compounds are synthesized and optimized using flow chemistry technology. A precursor to one novel compound can be synthesized from the lauric acid present in coconut oil. Key parameters, such as catalyst screening and loading, reaction time, temperature, residence time using flow chemistry techniques is investigated. The compounds are characterised using GC-MS, FT-IR, ¹H and ¹³C-NMR techniques, X-ray crystallography. The efficiency of the compounds is compared to two commercial plasticizers, i.e. Dibutyl phthalate and Eastman 168. Several PVC-plasticized film formulations are produced using the bio-based novel compounds. Tensile strength, stress at fracture and percentage elongation are tested. The property of having increasing plasticizer percentage in the film formulations is investigated, ranging from 3, 6, 9 and 12%. The diastereoisomers of each compound are separated and formulated into PVC films, and differences in tensile strength are measured. Leaching tests, flexibility, and change in glass transition temperatures for PVC-plasticized films is recorded. Research objective includes using these novel compounds as a green bio-plasticizer alternative in plastic products for infants. The inhibitory effect of the compounds on six pathogens effecting infants are studied, namely; Escherichia coli, Staphylococcus aureus, Shigella sonnei, Pseudomonas putida, Salmonella choleraesuis and Klebsiella oxytoca.

Keywords : bio-based compounds, plasticizer, tensile strength, microbiological inhibition , synthesis

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