

Utilization of Used Coconut and Palm Oils in Laundry Soap Formulation: Physicochemical Properties and Stains Removal Effectiveness

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Structured Abstract

Background: Improper disposal of used cooking oil (UCO), a common byproduct of domestic and commercial cooking, poses significant environmental and health hazards. In Malaysia, large volumes of used coconut oil (UCOS) and used palm oil (UPOS) are discarded, leading to clogged drainage systems, soil contamination, and water pollution. This study addresses these issues by converting UCOS and UPOS into environmentally friendly laundry soap using the Hot Saponification Process (HSP). These oils were selected due to their high availability and favorable fatty acid profiles suitable for soapmaking.

Methods: The Hot Saponification Process (HSP) was utilized in this study to make laundry bar soaps from used palm oil (UPOS) and used coconut oil (UCOS). Five formulations were developed with NaOH concentrations ranging from 10% to 50%. The soaps were assessed using pH, moisture content, total fatty matter (TFM), and foam height. Their stain removal effectiveness was evaluated using soy sauce, lipstick, and grease stains on a white cloth, assessing each soap's cleaning performance and overall quality. Stain removal effectiveness was scored on a scale from 1 (poor) to 5 (excellent).

Results: Soap formulated from UCOS with 10% NaOH (sample A2B1) exhibited the most balanced performance: pH 10.77, TFM 66.97%, foam height 18.5 cm, and high stain removal scores (5 for soy sauce and lipstick, 4 for grease). Higher NaOH concentrations increased pH but decreased both TFM and foam stability. Soaps made from UPOS showed higher pH values but were inferior in foam height and TFM. A2B1 complied with foam height (SNI), moisture (NIS), and TFM (EAS) standards, and aligned with literature-reported moisture content (9.0–11.0%).

Conclusion: The findings support the feasibility of formulating effective, eco-friendly laundry soap from UCOS using HSP. The A2B1 sample performed best in terms of cleanliness, physicochemical stability, and user safety. The concept emphasizes sustainable waste management and the practical reuse of UCO in household items.

Keywords: Used cooking oil, hot saponification process, laundry soap, stain removal, coconut oil

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