Modification of Bentonite with Nano Silica Oxide (SiO_2) for the Purification Process of Crude Palm Oil (CPO)

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Abstract

The efficiency of β-carotene removal is a critical parameter in commercial refining, as it directly influences the overall process effectiveness; therefore, the selection of appropriate bleaching agents is crucial. The limited effectiveness of Bleaching Earth (BE) in refining crude palm oil (CPO) to meet color standards poses a challenge. To improve BE's performance, natural bentonite was modified with nano-SiO_2 through a facile-mixing method. Bentonite was modified with nano-SiO_2 in concentrations of 5, 10, and 15% w/v, to assess the effectiveness of this modified bentonite in the CPO bleaching process. Bleaching was conducted at 90°C with a BE concentration of 0.5% w/v for 30 minutes. Characterization confirmed successful integration of modified Bentonite indicated by enhancing surface area. Bentonite modified with 15% nano-SiO_2 showed a significant improvement in bleaching performance, reducing β-carotene content to 553.84 ppm compared to 630.36 ppm with unmodified bentonite. The red/yellow color value also decreased to 1.5/15 from the original CPO value of 2.1/21, along with a reduction in FFA value. The results of this study indicate that modifying bentonite with nano silica oxide offers a solution to reduce the amount of bentonite used in the bleaching process.

Keywords
Bleaching earth, Color standards, Crude palm oil, SiO_2, β-carotene, Innovation

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