



Characteristics of calcined palm oil pastes for biosilica extraction as a function of calcination temperatures

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Abstract: Palm oil production in Malaysia has increased over the years. As the consequence of high production of palm oil, surplus quantities of palm oil biomass wastes such as empty fruit bunches (EFB), palm kernel shell (PKS), and oil palm decanter cake (DC) are generated. Generally, these wastes are used as fuel to generate steam for boilers, which end up as ash. As several agricultural wastes are well-known to be rich in silica content, this study aims to investigate the bio-silica content of EFB, PKS and DC and their characteristics when calcined at various calcination temperatures from 400°C to 800°C. Several analyses were conducted such as weight loss, color, BET, SEM and FTIR. The results have shown that all samples favorably exhibited silica at higher temperatures, i.e., 800°C. Color analysis depicted that combustible elements were mostly removed at 800°C, leaving non-combusted silica in the waste ash. Weight loss analysis presented that EFB achieved the highest weight loss at 99.05%, followed by PKS at 95.65% and DC at 83.95%. This led to a relatively high amount or purity of silica in the sample. BET analysis showed highest surface area, 20.087m²/g (PKS) and the lowest is 9.492m²/g (DC) at 800°C which verified the high porosity of samples for further absorption applications. The presence of silica was also significantly observed in 800°C FTIR spectra for all waste samples. Overall, it is concluded that EFB, PKS, and DC are highly potential wastes to contribute to the production of bio-silica, which thus can be an option to overcome waste disposal issues in palm oil industries.

Keywords: bio-silica, calcination, EFB, PKS, DC

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