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Cake compressibility analysis of BPOME from a hybrid adsorption-microfiltration process (Article)

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Abstract   ⌄ View references (34)

This study investigates the utility of a hybrid adsorption-membrane process for cake compressibility evaluation of biotreated palm oil mill effluent (BPOME). A low-cost empty fruit bunch (EFB) based powdered activated carbon (PAC) was employed for the upstream adsorption process with operation conditions of 60 g/L PAC dose, 68 min mixing time, and 200 rpm mixing speed to reduce the feed-water strength and alleviate probable fouling of the membranes. Two polyethersulfone microfiltration (MF) membranes of 0.1 and 0.2 μm pore sizes were investigated under constant transmembrane pressures (TMP) of 40, 80, and 120 kPa. The compressibility factors (z), which was obtained from the slopes of power plots (function of specific cake resistance (α) and pressure gradient) were evaluated. The z values of 0.32 and 0.52, respectively obtained, for the 0.1 and 0.2 μm MF membranes provided compressible and stable z values as observed from their power plots. Besides, these membranes were found suitable for the measurement of z since the results are in consonance with the established principle of cake compressibility. Moreover, the upstream adsorption mitigated the clogging of the membranes which ultimately led to moderate resistances and cake compressibility. These are indications that with the secondary cake filtration, a sustainable flux can be achieved during BPOME filtration. The membranes exhibited close to 100% restoration after cleaning.

Author keywords

Cake compressibility   MF membranes   POME   Pressure drop   Resistance   Sustainability

Indexed keywords

Engineering controlled terms: Activated carbon   Adsorption   Carbon   Compressibility   Effluents   Electric resistance   Microfiltration   Mixing   Palm oil   Pore size   Pressure drop   Sustainable development

Compendex keywords: Cake compressibilities   MF membrane   Micro-filtration membranes   Palm oil mill effluents   POME   Powdered activated carbon   Specific cake resistances   Transmembrane pressures

Engineering main heading: Membranes

EMTREE drug terms: activated carbon   manganese   polyethersulfone   silicon dioxide   industrial waste   palm oil   vegetable oil

GEOBASE Subject Index: activated carbon   adsorption   aquaculture effluent   coal   compressibility   concentration (composition)   filtration   membrane   operations technology   pollutant removal   pressure drop   sustainability

EMTREE medical terms: adsorption   alkalinity   Article   biotreated palm oil mill effluent   chemical oxygen demand   compression   effluent   membrane   membrane filter   membrane permeability   microfiltration   pressure   priority journal   turbidity   viscosity   water hardness   adsorption   filtration   industrial waste   procedures   waste management

MeSH: Adsorption   Filtration   Industrial Waste   Plant Oils   Waste Management

Chemicals and CAS Registry Numbers:

activated carbon, 64365-11-3, 82228-96-4; manganese, 16397-91-4, 7439-96-5; polyethersulfone, 25667-42-9; silicon dioxide, 10279-57-9, 14464-46-1, 14808-60-7, 15468-32-3, 60676-86-0, 7631-86-9; palm oil, 8002-75-3;

Industrial Waste; palm oil; Plant Oils

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