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Stability of skim latex suspension and rubber content recovery by microfiltration process: operating conditions and fouling characteristics

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ABSTRACT

To minimize the environmental impact of the latex industry and recover a large part of rejected skim latex, this research focused on the stabilization and concentration of skim latex suspension by chemical conditioning and microfiltration. The experiments were carried out in microfiltration stirred cell and cross-flow microfiltration unit to evaluate (1) suspension filterability and (2) critical permeate flux according to suspension conditioning. Critical permeate flux is defined as follows: when filtering feed suspension in cross-flow conditions during short time experiments, the trans-membrane pressure (TMP) increase induces firstly a linear evolution of permeate flux (J) before observing a progressive stabilization of J, even if there is a greater increase in TMP. The critical flux corresponds to the highest value of permeate flux obtained when the linear evolution J versus TMP is observed. Obtained results allowed the identification of critical filtering conditions, optimum chemical conditioning and incubation time to control membrane performances and fouling dynamics. The critical flux (J_{crit}) depended on the dry rubber content DRC of the filtered latex suspension, and decreased from 48.3 to 7.4 l m^2-h^{-1} when DRC increased from 5% to 20%. Under this condition, it could be possible to achieve a concentrated skim latex suspension (about 20% DRC) with acceptable permeate flux. Nevertheless, during long periods of filtration, membrane fouling was observed even in sub-critical conditions, but it was easily reversed by a hydrodynamic method such as rinsing or flushing with tap water. The colloidal status of concentrated skim latex still occurred with an average volatile fatty acid (VFA) of 0.01% which means a good state of stability. To assess the efficiency of the membrane filtration, very low values of permeate turbidity were noticed, at about 25 NTU in subcritical condition and 50 NTU at critical condition (with a natural yellow color), in comparison with the initial turbidity of skim latex suspension, at about 60,000 NTU.

Keywords: Skim latex suspension; Microfiltration; Cross flow; Conditioning; Fouling; Rubber content recovery

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