Sticky removal from wastewater characterized by dynamic surface tension measurements

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Tailored starch, which has cationic charges as well as hydrophobic units, can be used for the removal of so called “stickies”. They were formed in modern papermaking mills due to the recycling of paper and closed whitewater recirculating systems. The aim of the present work is the general study of the complex formation between such cationic starches and stickies. Model suspensions (“Extract”) were obtained by the recycling of paper and addition of latex. The properties of the formed complexes depend on the ratio of charges (anionic wastewater suspension/cationic starch) and can be characterized by the charge, the turbidity or the particle size of the dispersion.

In addition, because the wastewater is highly surface active, the process can be investigated via dynamic surface tension measurements using the drop and bubble profile analysis tensiometry (PAT-1, SINTERFACE Technologies, Berlin, Germany).

As shown in Fig. 1 as an example, the low surface tension of the wastewater (blue line) increases by the addition of starch. The surface activity decreases in dependence on the amount (volume ratio Extract : starch) and properties (charge, hydrophobicity) of the starch. Due to the complex formation between stickies and cationic starch (and complex precipitation), the surface tension of the suspensions increases. The removal of stickies can be further improved by the addition of bentonite. Whereas a strong lowering of the surface tension with time was obtained for the pure wastewater, the surface tension of a mixture (Extract: starch solution = 2, 5:1) in presence of bentonite is nearly constant over time and similar to pure water. With increasing starch concentration (2:1, 1:1) the sticky removal becomes less effective due to restabilization.


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