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Combination of Fenton oxidation and sequencing batch reactor (SBR) for wastewater treatment of rubber accelerators

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pH adjustment

Problem: The wastewater from the production of CBS and TBBS (two rubber accelerators) contains high concentrations of organic pollutants and salinity. The organic pollutants are not easily biodegradable. Therefore the wastewater can not directly be treated by the method of SBR in which pollutants are decomposed by microbes in the sludge. As a primary treatment before SBR, Fenton oxidation (H_2O_2 + Fe^{2+}/Fe^{3+}) is used to oxidize pollutants into intermediates which are easily biodegradable.

Objective: The target of this work was to optimise the process of wastewater treatment of rubber accelerators. This process contains three steps: pH adjustment, Fenton oxidation and SBR. Because SBR has not been sufficiently effective, alternatives for this step have been tested.

Solution: No general solution for this problem could be found because the waste water composition was extremely variable. For the examined waste water, optimum conditions for the pH adjustment at pH 1.1 - 1.3 and for the Fenton

Fenton oxidation

SBR

Ferropore

Preparing COD measuring

oxidation at pH 4, Fe^{2+} concentration 900 mg/l and H_2O_2 concentration of 18 g/l. The reaction time to reduce over 70 % of the COD took at least 10 h.

The SBR was able to remove 25 % of the COD within 24h. The tested alternatives were Ferropore (20 % removal within 24h) and activated carbon (over 30 % removal within 13.5 h) were in the same range. Activated carbon achieved the best results but is also the most expensive reagent.

The results showed that it is possible to bring the COD value down from over 11’000 mg/l to less than 1’000 mg/l but that is still not sufficient to meet the limits. To clean the wastewater further, more steps are needed. Possibilities are combinations of Ferropore or activated carbon with the SBR process.