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Full-scale anaerobic sequencing batch biofilm reactor for sulfate-rich wastewater treatment

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ABSTRACT

This paper describes the performance and biofilm characteristics of a full-scale anaerobic sequencing batch biofilm reactor (ASBBR; 20 m^3) containing biomass immobilized on an inert support (mineral coal) for the treatment of industrial wastewater containing a high sulfate concentration. The ASBBR reactor was operated during 110 cycles (48 h each) at sulfate loading rates ranging from 6.9 to 62.4 kgSO_4^{2-}/cycle corresponding to sulfate concentrations of 0.58–5.2 gSO_4^{2-}/L. Domestic sewage and ethanol were utilized as electron donors for sulfate reduction. After 71 cycles the mean sulfate removal efficiency was 99%, demonstrating a high potential for biological sulfate reduction. The biofilm formed in the reactor occurred in two different patterns, one at the beginning of the colonization and the other of a mature biofilm. These different colonization patterns are due to the low adhesion of the microorganisms on the inert support in the start-up period. The biofilm population is mainly made up of syntrophic consortia among sulfate-reducing bacteria and methanogenic archaea such as *Methanosaeta* spp.

Keywords: Sulfate reduction; Anaerobic reactor; Mineral coal; Biofilm; Ethanol; Industrial wastewater

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