[P050]

Lab-scale bioreactors for aromatic amines reduction under denitrification conditions

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Under anaerobic conditions, azo dyes are readily decolourised as a result of the reductive transformation of the azo group leading to the formation of aromatic amines which are known to be even more toxic than the original dyes. A logical concept for the removal of azo dyes in biological wastewater treatment systems is based on the combination of anaerobic/aerobic treatment, for the degradation of also aromatic amines. A drawback of aerobic treatment is that many aromatic amines are prone to autoxidation. Nitrate/Nitrite are powerful electron acceptors as alternative to oxygen, avoiding the autoxidation. Our research consisted of operating two bioreactors with the objective to investigate the fate of aromatic amines under denitrifying conditions. The reactors were fed with synthetic wastewater contained aniline and/or sulfanilic acid and a mixture of volatile fatty acids as the primary electron donors. Reactor 1 (R1) contained a stoichiometric concentration of nitrate and Reactor 2 (R2) a mixture of nitrate and nitrite as terminal electron acceptors. The R1 results demonstrated that aniline could be degraded under denitrifying conditions while sulfanilic acid remains. The presence of nitrite in the effluent of R2, at low pH, caused a chemical reaction that led to immediate disappearance of both aromatic amines and the formation of an orange colour solution. HPLC analysis revealed the presence of phenol as a product of aniline. Other compounds were detected by LC_MS. The overall COD removal was always higher in R1 than in R2, suggesting toxicity of nitrite and/or the formed products. Whereas a replacement of amino-groups by hydroxyl-groups holds promise for biodegradability, the results indicate that the chemical reaction is more complex, resulting in the formation of compounds that were not mineralized during the course of the experiment.

Keywords: aromatic amines, bioreactor, reduction, denitrification conditions