

Textile Wastewater Ecotoxicity Abatement after Aerobic Granular Sludge Treatment and Advanced Oxidation Process

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Abstract : Textile effluents are usually heavily loaded with organic carbon and color compounds, the latter being azo dyes in an estimated 70% of the case effluent posing a major challenge in environmental protection. In this study, the ecotoxicity of simulated textile effluent after biological treatment with anaerobic and aerobic phase (aerobic granular sludge, AGS) and after advanced oxidation processes (AOP) namely ozonation and UV irradiation as post-treatment, were tested to evaluate the fitness of this treatments for ecotoxicity abatement. AGS treatment achieved an 80% removal in both COD and color. AOP was applied with the intention to mineralize the metabolites resulting from biodecolorization of the azo dye Acid Red 14, especially the stable aromatic amine (4-amino-1-naphthalenesulfonic acid, 4A1NS). The ecotoxicity evaluation was based on growth inhibition of the algae *Pseudokirchneriella subcapitata* following OECD TG 201 except regarding the medium, MBL medium was used instead. Five replicate control cultures and samples were performed with an average STD of 2.7% regarding specific algae growth rate determination. It was found that untreated textile effluent holds an inhibition of specific growth rate of 82%. AGS treatment by itself is able to lower ecotoxicity to 53%. This is probably due to the high color removal of the treatment. AOP post-treatment with Ozone and UV irradiation improves the ecotoxicity abatement to 49 and 43% inhibition respectively, less significantly than previously thought. Since over 85% of 4A1NS was removed by either of the AOP (followed by HPLC), an individual ecotoxicity test of 4A1NS was performed showing that 4A1NS does not inhibit algae growth (0% inhibition). It was concluded that AGS treatment is able by itself to achieve a significant ecotoxicity abatement of textile effluent. The cost-benefit of AOP as a post-treatment have to be better assessed since their application resulted in an improvement of only 10% regarding ecotoxicity effluent removal. It was also found that the 4A1NS amine had no apparent effect on ecotoxicity. Further studies will be conducted to study where ecotoxicity is coming from after AGS biological treatment and how to eliminate it.

Keywords : textile wastewater, ecotoxicity, aerobic granular sludge, AOP

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