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Evaluating treatment options for wastewater generated from production of metal complex dyes

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ABSTRACT

Dye manufacturing process wastewater (DMPW) generated from production of metal complex dyes might be mainly consisted of organic chelates. It is hypothesized that these organic chelates might form complex with metal ions. As the result, coagulation, frequently employed for dyeing wastewater treatment through sweep-floc mechanism, might not be an effective process to treat DMPW, since Fe(III) or Al(III) might be chelated by organic dye molecules instead of precipitated as metal hydroxides. In this study, carbon/chelated Fe^{3+} molar ratio (C/Fe ratio) is used to represent the content of organic chelates in DMPW and is subsequently used to explore destruction of these chelates after various treatment processes. Finally, the treatment options for DMPW are proposed based on C/Fe ratio after various treatment processes. The C/Fe ratio of biologically treated DMPW is almost two times higher than that of raw DMPW, indicating that biological treatment process is very effective for destroying chelating functional groups and could be employed as a pretreatment process to improve coagulation efficacy subsequently. On the other hand, the C/Fe ratio of the advanced oxidation process-treated DMPW is quite close to that of raw DMPW, indicating that destruction of chelating molecules by heat-activated persulfate is a non-selective process.

Keywords: Metal complex dye; Chelating; Coagulation; Adsorption; Biological treatment

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