Simultaneous Color-COD Removal in Textile Wastewater Using Immobilized-Cell Beads in an Anaerobic-Aerobic Hybrid Reactor

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ABSTRACT

Many bacteria have been shown to reduce azo dyes to the corresponding amino. Further degradation of these intermediates is readily achieved under aerobic conditions, but the products of this reduction are usually recalcitrant under anaerobic conditions. Therefore, a sequenced anaerobic/aerobic treatment system for the total degradation of azo dyes appears to be an attractive and logical choice. A two-stage approach to treat azo dyes is proposed in the previously study, with the first stage (anaerobic fluidized-bed reactor) used to anaerobically reduce the azo dyes and produce the corresponding amines and the second stage (CSTR) being used to aerobically degrade these amines. Up to now, the results showed that the sequential anaerobic-aerobic reactor with immobilized-cell beads system was proved to have a good capability to remove color and COD, simultaneously, from the textile wastewater. In order to optimize the sequential anaerobic-aerobic process and overall economics of the corresponding technology, we combined the anaerobic and aerobic phases into one single unit called the anaerobic-aerobic hybrid reactor (AnAHR) in further study. The advantages of this innovative design include reduced aeration costs and lower space requirements. The objectives of the study is divided into three sections. The first section is focused on the design and put up the AnAHR reactor, and deals with the effects of aeration ratio, cycle ratio, and hydraulic retention time (HRT), and initial dye concentration on the removal efficiencies of decolorization and COD. The second section of this research deals with the decolorization efficiency for the influent containing several dyes under the optimal operation condition. The second section of this research deals with the feasibility of the immobilized-cell reactor system for application to treatment of wastewater from a textile industry. The results of this project will provide a more thorough understanding of the total degradation of azo dye in an AnAHR reactor using intermittent aeration (IA) process. It will also provide useful engineering data for process design and scale-up when applicable to the practical treatment system.

Keywords : Anaerobic-Aerobic ; Textile Wastewater ; Color ; Immobilized Technology ; Intermittent Aeration

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