THE STUDY ON THE PHOTOREACTO DESIGN FOR THE TREATMENT OF DYE WASTEWATERS BY UV/O3 PROCESS

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ABSTRACT

THE PURPOSE OF THIS STUDY IS TO DEVELOP THE DESIGN EQUATIONS OF AN ANNULAR PHOTOREACTOR FOR THE TREATMENT OF DYE WASTEWATERS BY VARIOUS ADVANCED OXIDATION PROCESSES. THE UV/O3 AND UV/H2O2/O3 PROCESSES ARE APPLIED TO TREAT THE DYE WASTEWATERS TO INVESTIGATE THE REMOVAL CHARACTERISTICS OF POLLUTANTS AND EVALUATE THE TREATMENT EFFICIENCIES OF AOPS . THE PHOTOREACTOR DESIGN EQUATION WAS ESTABLISHED BY COMBINING WITH THE CHEMICAL KINETICS OF THE PHOTOOXIDATION SYSTEMS, EMPIRICAL RATE EXPRESSION OF OXIDANTS AND DYE POLLUTANTS, AND UV LIGHT DISTRIBUTION MODEL IN THE PHOTOREACTOR, AND WAS USED TO PREDICT THE DECOMPOSITION OF POLLUTANTS (REACTIVE RED 141, ACID BLUE 62 AND DIRECT YELLOW 86) WITHIN PHOTOREACTOR OF GEOMETRIES AT VARIOUS OPERATING CONDITIONS (HYDRAULIC RETENTION TIMES, SOLUTION PH VALUES, UV LIGHT INTENSITIES, INITIAL CONCENTRATIONS OF DYES, AND DOSAGES OF OXIDANTS) TO VERIFY ITS RATIONALITY AND FEASIBILITY. THE DECOLORATION RATE OF DYES IN AQUEOUS SOLUTIONS WAS FOUND TO INCREASE WITH THE INCREASING OF UV LIGHT INTENSITY AND DOSAGE OF OXIDANTS, AND WITH DECREASING OF SOLUTION PH VALUE AND THE RI/RO RATIO OF PHOTOREACTOR. THE ORDER OF THE DECOMPOSITION RATES OF DYES BY UV/O3 PROCESS IS BLUE 62＞RED 141＞YELLOW 86, AND RED 141＞BLUE 62＞YELLOW 86 BY UV/H2O2/O3 PROCESS. THE PHOTOREACTOR DESIGN EQUATION DEVELOPED WAS FOUND REASONABLELY TO PREDICT REACTION BEHAVIORS OF DYES AT VARIOUS OPERATING CONDITIONS AND DISTRIBUTION PROFILE WITHIN PHOTOREACTOR. THE RESULTS OF THIS RESEARCH CAN BE AS USEFUL BASES OF THE FUTURE APPLICATION OF THE UV-BASED ADVANCED OXIDATION PROCESSES.

Keywords : ADVANCED OXIDATION PROCESSES (AOPS), DYE WASTEWATERS, ANNULAR PHOTOREACTOR, DESIGN EQUATION

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