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Evaluation of Microbial Accumulation of Household Wastewater Purified by Advanced Oxidation Process

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Abstract : Water scarcity is an unavoidable issue impacting an increasing number of individuals daily, representing a global crisis stemming from swift population growth, urbanization, and excessive resource exploitation. Consequently, solutions that involve the reclamation of wastewater are considered essential. In this context, household wastewater, categorized as greywater, plays a significant role in freshwater used for residential purposes and is attributed to washing. This type of wastewater comprises diverse elements, including organic substances, soaps, detergents, solvents, biological components, and inorganic elements such as certain metal ions and particles. The physical characteristics of wastewater vary depending on its source, whether commercial, domestic, or from a hospital setting. Consequently, the treatment strategy for this wastewater type necessitates comprehensive investigation and appropriate handling. The advanced oxidation process (AOP) emerges as a promising technique associated with the generation of reactive hydroxyl radicals highly effective in oxidizing organic pollutants. This method takes precedence over others like coagulation, flocculation, sedimentation, and filtration due to its avoidance of undesirable by-products. In the current study, the focus was on exploring the feasibility of the AOP for treating actual household wastewater. To achieve this, a laboratory-scale device was designed to effectively target the formed radicals toward organic pollutants, resulting in lower organic compounds in wastewater. Then, the number of microorganisms present in treated wastewater, in addition to the chemical content of the water, was analyzed to determine whether the lab-scale device eliminates microbial accumulation with AOP. This was also an important parameter since microbes can indirectly affect human health and machine hygiene. To do this, water samples were taken from treated and untreated conditions and then inoculated on general purpose agar to track down the total plate count. Analysis showed that AOP might be an option to treat household wastewater and lower microorganism growth.

Keywords : usage of household water, advanced oxidation process, water reuse, modelling
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