Multifunctional System for Treatment of Wastewaters from Adhesive-Producing Industries: Separation of Solids and Oxidation of Dissolved Pollutants Using Doted Microfiltration Membranes

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Due to rinsing the formulation vessels the adhesive-producing industry is generating large amounts of specifically polluted wastewaters day by day. These mainly contain in diluted form the ingredients of the later adhesives, i.e. polymers and fillers; thus, they are rich of solids, non-biodegradable and include germs.

Usual treatment procedures do not grant a complete and economical purification; hence, this thesis introduces and valuates a new process. First, the solids are nearly totally removed by a two-step precipitation and flocculation. Afterwards, a photo-oxidative technique is planned to be used, destroying the dissolved matter as well as solving the problem of germination. The technique is based on the catalyst titanium dioxide, which as a semiconductor is able to generate electrons and positive holes for oxidation under UV-A radiation. New is the handling of the catalyst: up to now it has been applied as a suspension or a surface layer, here it is included into an organic membrane as a doping. This avoids separation of the titanium dioxide; nevertheless, a convective transport of the pollution towards the reaction sites is ensured and the inhibition of diffusion by immobilized systems is obviated. As a result, the yield of inserted photons enhances from so far 2% to 7%. Aqueous solutions of 4-chlorophenol as a model substance are treated as well as real soil eluates containing TNT and wastewaters including residues of pharmaceuticals. Based on mechanistic considerations, a mathematic model describing the reaction system is presented.

A module equipped with this type of membranes yields good results on different types of contaminated waters; nevertheless, the real application on the destruction of organics in adhesive wastewaters is inhibited since small amounts of adhesives remain and block the membranes in a relatively short time. Alternatively, a treatment with activated carbon removes the dissolved matter effectively.