

ADVANCED OXIDATION OF DICLOFENAC IN VARIOUS AQUATIC ENVIRONMENTS

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Abstract: Many of the drugs used are not completely metabolized in the human body and with urine and feces are introduced into the sewage system. Finally, due to their incomplete removal during the conventional wastewater treatment process (CWTP), they can be released into the receiving water. One of the medicaments frequently detected in surface water is diclofenac. The present study addresses the problem of diclofenac removal in various aquatic samples using advanced oxidation processes (AOPs). The experiments were performed in distilled water and in biologically treated wastewater. The following AOPs were applied: Fenton's reagent, UV- and UV/H₂O₂-processes. The concentration of diclofenac in distilled water corresponded to the concentration of this drug in human urine (ca. 20 mg·dm⁻³). The real wastewater samples contained diclofenac concentrations ranging from 630 to 790 ng·dm⁻³. The photodegradation of diclofenac was carried out in the photoreactor with a medium pressure Hg – vapor lamp (400 W). In the Fenton's reaction different molar ratios of H₂O₂/Fe²⁺ were used. The diclofenac mineralization (TOC removal) strictly depended on the amount of H₂O₂ applied in the Fenton's reaction. Diclofenac was rapidly degraded by direct photolysis (UV) and in UV/H₂O₂ process both in distilled water and in wastewater samples. The results proved that the advanced oxidation processes are effective in diclofenac removal from aquatic samples. The pseudo first order rate constants for diclofenac photodegradation were determined.