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**Novel pilot scale continuous photocatalytic membrane reactor
for removal of organic micropollutants from water**

**Konstantinos V. Plakas ^a, Vasilis C. Sarasidis ^a, Sotiris I. Patsios ^a, Dimitra A. Lambropoulou ^b,
Anastasios J. Karabelas ^{a,*}**

^a *Chemical Process and Energy Resources Institute, Centre for Research and Technology – Hellas (CERTH), 6th km Charilaou-Thermi Road, Thermi, Thessaloniki, GR 57001, Greece*

^b *Department of Chemistry, Aristotle University of Thessaloniki, Thessaloniki 54124, Greece*

Abstract

A novel, fully automated Photocatalytic Membrane Reactor (PMR) pilot unit is presented and evaluated (at different operating process parameters and real treatment conditions) for degradation of the pharmaceutical diclofenac (DCF), a typical recalcitrant micropollutant. The PMR-pilot has a maximum system capacity of 1.2 m³/d of treated water, 52 W of UV-C power, and combines two modern processes; i.e. heterogeneous photocatalysis and membrane separation, employing dispersed TiO₂ nanoparticles with UV-C irradiation, and submerged ultrafiltration hollow fibers, respectively. Pilot tests with two types of natural (tap and surface) water under stable, continuous operation, permitted the assessment of the PMR unit performance (for DCF degradation, TOC mineralization) in terms of hydraulic residence time (HRT), TiO₂ loading, UV-C irradiation dose, and DCF feed concentration. Under the specific conditions tested, the catalyst loading and UV-C radiant power significantly affected DCF removal; however, HRT had a rather insignificant effect. Additionally, several transformation products (TPs) were identified by means of liquid chromatography-mass spectrometry using electrospray interfacing technique, thus, shedding light into possible reaction pathways leading to DCF mineralization.

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