

Remediation of Municipal Waste Waters by Artificial Wetlands

Invited Speaker: Prof. Dr. J.M. Bayona, CID-CSIC, Barcelona, Spain

Abstract: Constructed wetlands (CWs) constitute a wastewater treatment alternative to small communities due to their low operational cost, reduced energy consumption, and almost no sewage sludge production. Although much information is available about conventional water quality parameters (e.g. BOD5 and TSS) in CWs, few data regarding pharmaceuticals and personal care products (PPCPs) are currently available.

The objective of this work was to evaluate the elimination of selected PPCPs in CWs of different configurations. In this regard, whereas in the horizontal flow (HF) CWs the organic matter removal is mostly by anaerobic pathways (i.e. denitrification, sulphate reduction and methanogenesis), in vertical flow (VF) CWs and surface flow (SF) CWs the aerobic environment

prevails. These different environments, according to the CW configuration, are of primary importance in order to eliminate the emerging pollutants from wastewater because of their high oxygen dependence (Table 1). In full-scale systems, usually hybrid systems combining ponds and constructed wetlands are operated in order to combine both aerobic and anaerobic systems. Hence, whereas SSVF with unsaturated flow seems to be feasible as secondary treatment to attenuate the PPCP pollution from domestic wastewater of small communities, and the SFCW is as tertiary treatment and landscape restoration.

Table 1. Average (n=6) PPCP removal efficiency (%) in subsurface vertical flow (SSVF), subsurface horizontal flow (SSHF) and surface flow (SFCW). Comparison with a full-scale hybrid system.

	Pilot			Full-scale
	SSHFA ^a	SSVFA ^a	SF ^b	FP-SF-SSF ^c
Ibuprofen	71	99	96	45
Clofibric acid	n.r.	n.d.	36	n.d.
Ketoprofen	n.r.	n.d.	99	80
Naproxen	85	89	92	82
Diclofenac	15	73	96	78
Carbama zepine	16	26	47	n.d.
Caffeine	97	98	n.d.	95
Methyl dihyd asmonate	99	99	n.d.	90

^a Secondary treatment; ^b Tertiary treatment; ^c Facultative Pond.
n.d: not detected; n.r; not removed

Short Curriculum Vitae: Josep M. Bayona is Research Professor at the Institute of Environmental Assessment and Water Research (IDAEA) from the Consejo Superior de Investigaciones Científicas (CSIC) in Barcelona (Spain). His main research interests are the Environmental Chemistry focusing on the transformation processes and the pathway of organic contaminants in the environment and engineered ecosystems. He has been appointed Member of the National Committee to cope with the ecological

emergency in the Doñana, National Park 1997-1999, GESAMP (Group of Experts on the Scientific Aspects of Marine Pollution) membership 2008. He was editor of the Analytical Chemistry A pages (2003-2005), co-editor of Comprehensive Sampling and Sample Preparation Encyclopedia (Elsevier) and editorial board of the International Journal of Environmental Chemistry.