

Nanotechnologies for Removal of Pharmaceuticals and Personal Care Products from Water and Wastewater. A Mini Review

Alessandra Cincinelli^{1,*}, Tania Martellini¹, Ester Coppini²,
Donatella Fibbi², and Athanasios Katsoyiannis³

¹Department of Chemistry, via della Lastruccia 3—50019 Sesto Fiorentino (Florence), Italy

²GIDA S.p.A., Via di Baciacavallo, 36, 59100 Prato, Italy

³Norwegian Institute for Air Research, FRAM—High North Research Centre on Climate and the Environment, NO-9296 Tromsø, Norway

The occurrence of pharmaceuticals and other hazardous substances in surface waters and drinking water and the long-term exposure may represent a potential risk for both the environment and human health. Many studies have evidenced that conventional technologies used for wastewater treatment do not completely remove pharmaceuticals and personal care products (PPCPs) residues, which can be detected in receiving waters at concentrations ranging from few ng L⁻¹ until more than μg L⁻¹. Nanomaterials are of fundamental importance in the current research efforts to develop more efficient water treatment and remediation systems in place of conventional technologies. This review provides a comprehensive overview of the most relevant works available in literature reporting the use of nanosorbents (nanotubes and zeolites), nanofiltration (NF) and advanced oxidation processes (AOPs) for the removal of PPCPs compounds from water and wastewater. The literature review of laboratory- and pilot-scale studies have shown that nanomaterials are promising tools in environmental cleaning processes and water purification, even if more researches are necessary.

Keywords:

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1. INTRODUCTION

In the last decades, thanks to the improvements and advances in detection methods and the increasing use of chemical substances in human activities, a large number of organic micro pollutants have been detected at very low concentrations in surface waters and wastewaters. These organic compounds might represent a serious

risk for human health and natural ecosystems and a limitation for the potential reuse of wastewaters. Perfluorinated compounds, pesticides, hormones, flame retardants, pharmaceuticals and personal care products (PPCPs), nanomaterials, musk fragrances are some of these chemicals, commonly classified as emerging organic contaminants (EOCs). Among EOCs, PPCPs, including prescription and non prescription human and veterinary pharmaceutical compounds and personal care products, are of particular concern because increasing amounts of these drugs are released in the environment through flushing of unused medication, improper disposal, manufacturing processes, human and animals excretions^{1,2} run-off from animal feedlots and grazing farmland.³ PPCPs are classified according to their therapeutic uses. Thus the mainly detected pharmaceuticals in urban wastewaters, receiving surface waters or re-used waters are analgesics, antibiotics, anticonvulsants, hormones, fragrances, β-blockers, antidepressants, antiepileptics^{4,5}

* Author to whom correspondence should be addressed.