LIFE CLEAN UP - Validation of adsorbent materials and advanced oxidation techniques to remove emerging pollutants in treated wastewater

LIFE16 ENV/ES/000169

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Contact details:

Contact person: David Heiser
Tel: 34968278712
Email: dcheiser@ucam.edu

Project description:

Background

New and emerging pollutants (EPs) are synthetic or naturally occurring chemicals that are known or suspected of causing negative impacts on human health and the environment, but not all of them are yet commonly monitored; for example, they are not listed as pollutants by the Environmental Quality Standards Directive or Priority Substances Directive.

The major source of EPs is urban wastewater, as well as the effluents of the Waste Water Treatment Plants (WWTPs) of hospitals, agriculture and industry.

Current WWTPs are not designed for the treatment and removal of EPs, resulting in them being discharged into the environment. Furthermore, many of them are known or suspected of being bioaccumulative and having a biomagnification character, increasing the risks of them entering aquatic and land ecosystems as well as drinking water sources.

Objectives

LIFE CLEAN UP aims to validate an innovative, efficient and environmentally friendly system to remove EPs and other pathogens from wastewater. The solution consists of an adsorption system coupled with an advanced oxidation technology.

Different polymers, including cyclodextrins and hydrogels and biomaterials from agriculture, will be tested in order to devise an optimised adsorption system,

which aims to retain a high concentration of different families of EPs. On its way out of the adsorption system, the project will test the treating of the water with an advanced oxidation process (AOP) involving light pulses, photocatalysis and photosensitisers to degrade pollutants and pathogens that were not previously retained.

The project will demonstrate a system that integrates the proposed technologies – retention by adsorbent materials and destruction by AOPs – in a working WTTP on a semi-industrial scale, validating the process by comparing laboratory and plant results. This system will be fed by renewable energy and will not generate waste (as the materials will be re-usable).

To support its ultimate aim of reducing negative impacts on ecosystems and human health, the project will produce guidance to support take up of the system by WWTPs on an industrial scale. By removing pollutants that are not targeted by current water management systems in this way, the project aims to directly contribute to the implementation of European Directives on priority substances in the field of water policy as well as to the Water Framework Directive.

Expected results:

- Validation, including economic and environmental feasibility, of a semi-industrial prototype of a depuration system that retains more than 90% of the EPs through adsorbent materials;
- Near total (98%) degradation by AOPs of adsorbed EPs and residual EPs still present in treated wastewater at the end of the process;
- An energy self-sufficient system using photovoltaic panels (8 700 kWh/year);
- Treatment capacity of the prototype at semi-industrial scale of 5 m3/h, treating around 43 000 m3/year or 14% of the wastewater treated in a WWTP for a small population (around 4 600 inhabitants);
- Demonstration of the feasibility of the system as well as its compatibility with current wastewater depuration systems and high transferability potential at industrial scale covering all the volumes treated in a WWTP; and
- Support for take up of the technology by producing guidelines for different adsorbent materials of EPs, working protocols and operational criteria about light pulses, photocatalysis and photosensitisers to eliminate organic pollutants, a cost-benefit analysis, a market study, a business plan and an exploitation plan of the proposed system.

Results

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Environmental issues addressed:

Themes

Water - Waste water treatment

Keywords

water quality improvement, waste water treatment

Target EU Legislation

- Water
- Directive 2008/105 - Environmental quality standards in the field of water policy (16.12.2008)
- Directive 2000/60 - Framework for Community action in the field of water policy (23.10.2000)

Natura 2000 sites

Not applicable

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Beneficiaries:

Coordinator	FUNDACIÓN UNIVERSITARIA SAN ANTONIO DE CARTAGENA
Type of organisation	University
Description	UCAM Universidad Católica San Antonio de Murcia is a private university founded in 1996. The Research Group on Molecular Recognition and Encapsulation (REM) focuses on the work of ICT in the study of molecules related to food and agricultural products in order to improve them.
Partners	Consiglio Nazionale delle Ricerche – Istituto per i processi Chimico Fisici, Spain Asociación Empresarial de Investigación Centro Tecnológico Nacional de la Conserva y Alimentación, Spain HIDROGEA, Gestión Integral de Aguas de Murcia, S.A., Spain HIDROTEC TRATAMIENTO DE AGUAS, S.L., Spain Regenera Levante, S.L., Spain Università degli Studi "Aldo Moro" di Bari, Spain

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Administrative data:

Project reference	LIFE16 ENV/ES/000169
Duration	01-OCT-2017 to 30-SEP -2020
Total budget	1,492,512.00 €
EU contribution	895,506.00 €
Project location	Murcia(España)

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