

NEWSLETTER

July
23

Υβριδικό μοντέλο επεξεργασίας
στραγγισμάτων ΧΥΤΑ συνδυάζοντας
τη χρήση Προχωρημένων
Οξειδωτικών Διεργασιών
Αντιρρύπανσης (ΠΟΔΑ) και την
τεχνολογία των μεμβρανών



UV-LEACH

«ΕΡΕΥΝΩ – ΔΗΜΙΟΥΡΓΩ – ΚΑΙΝΟΤΟΜΩ»



«ΕΡΕΥΝΩ – ΔΗΜΙΟΥΡΓΩ – ΚΑΙΝΟΤΟΜΩ»
Β' ΚΥΚΛΟΣ



UV-LEACH



Ευρωπαϊκή Ένωση
Πρόγραμμα Ανάπτυξης

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
ΥΠΟΥΡΓΕΙΟ
ΑΝΑΠΤΥΞΗΣ ΚΑΙ ΕΠΕΝΔΥΣΕΩΝ

ΕΠΑΝΕΚ 2014-2020
ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ
ΑΝΤΑΓΩΝΙΣΤΙΚΟΤΗΤΑ
ΕΚΠΑΙΔΕΥΣΗ, ΔΙΑ ΒΙΟΥ ΜΑΘΗΣΗ
ΚΑΙ ΚΑΙΝΟΤΟΜΙΑ



Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης



ΤΜΗΜΑ ΧΗΜΕΙΑΣ
ΑΡΙΣΤΟΤΕΛΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΟΝΙΚΗΣ

ΚΕΔΕΚ
ΚΕΝΤΡΟ ΕΛΕΓΧΟΥ ΚΑΙ ΠΡΟΛΗΨΗΣ
ΕΠΙΧΕΙΡΗΣΙΑΚΗΣ ΚΑΙΝΟΤΟΜΙΑΣ Α.Ε.



Διαδύμα
ΔΙΑΧΕΙΡΙΣΗ ΑΝΑΠΤΥΞΗΣ
ΑΤΤΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ Α.Ε.

ΕΛΛΗΝΙΚΟ
ΑΝΟΙΚΤΟ
ΠΑΝΕΠΙΣΤΗΜΙΟ



Υβριδικό Μοντέλο Επεξεργασίας στραγγισμάτων ΧΥΤΑ

15 προφορικές και
αναρτημένες ανακοινώσεις
Σε διεθνή συνέδρια

**11th European Conference on
Pesticides and Related Organic
Micropollutants in the Environment &
the 17th Symposium on Chemistry and
Fate of Modern Pesticides (Ioannina
23-26, June)**



CONFERENCES

**“LANDFILL LEACHATE TREATMENT USING UV-
FENTON PROCESSES AND COAGULATION AS A
PRETREATMENT STEP”**

P. Parthenidis¹, E. Evgenidou^{1,2}, D. Lambropoulou^{1,2}

**“A HIGH- RESOLUTION MASS SPECTROMETRY-
BASED INTEGRATED WORKFLOW FOR THE
TARGET ANALYSIS
AND SUSPECT SCREENING OF PER- AND
POLYFLUOROALKYL SUBSTANCES IN
WASTEWATERS
AND LEACHATES”**

L-A. Koronaiou^{1,2}, C. Nannou^{1,2}, D. Bikiaris³, D.
Lambropoulou^{1,2}

**“SULFATE RADICAL-BASED AOPS FOR THE
REMOVAL OF PROPRANOLOL FROM WATER AND
HIGHLY CONTAMINATED
AQUEOUS MATRICES”**

A. Maliogka¹, A. Rapti¹, E. Evgenidou^{1,2}, D.
Lambropoulou^{1,2}

POSTER PRESENTATIONS



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Laboratory, Department of Chemistry, AUTH,
Thessaloniki



«ΕΡΕΥΝΑ – ΔΗΜΙΟΥΡΓΙΑ – ΚΑΙΝΟΤΟΜΙΑ»
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UV-LEACH



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ΕΠΕΞΕΡΓΑΣΙΑΣ ΑΥΤΟΜΑΤΩΝ



Διαδύμα
ACCEPTED AUTHORITATIVE
SYSTEM MANAGEMENT

ΕΛΛΗΝΙΚΟ
ΑΝΟΙΚΤΟ
ΠΑΝΕΠΙΣΤΗΜΙΟ



**18th Annual Workshop On
Emerging High-Resolution
Mass Spectrometry (HRMS)
And LC-MS/MS Applications
In Environmental Analysis
And Food Safety (Barcelona
10-11, October)**



ORAL PRESENTATIONS



UV-LEACH

ΣΥΝΕΔΡΙΑ

**“LC–HRMS SUSPECT SCREENING WORKFLOW TO
ELUCIDATE TRANSFORMATION PRODUCTS OF
LINCOMYCIN AFTER PHOTOCATALYTIC
ABATEMENT USING MOF-BASED
PHOTOCATALYSTS ”**

D. Lambropoulou^{1,2}, E. Evgenidou^{1,2}, C. Nannou^{1,2}, A.
Kontogiannis¹, D. Bikiaris³

**“COMPACT SUSPECT SCREENING WORKFLOW
FOR THE ELUCIDATION OF TPS OF THE DIURETIC
DRUG FUROSEMIDE”**

L-A. Koronaίου^{1,2}, C. Nannou^{1,2}, M. García Valverde⁴,
E. Evgenidou^{1,2}, D. Lambropoulou^{1,2}

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«ΕΡΕΥΝΩ – ΔΗΜΙΟΥΡΓΩ – ΚΑΙΝΟΤΟΜΩ»
Β' ΚΥΚΛΟΣ



UV-LEACH



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Διαδύναμη
ΑΝΑΡΧΙΤΕΧΝΙΚΟ ΠΡΟΓΡΑΜΜΑ
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ΑΝΟΙΚΤΟ
ΠΑΝΕΠΙΣΤΗΜΙΟ

**5th Iberoamerican
Conference on Advanced
Oxidation Technologies
(Cusco-Peru 7-11, November)**



ΣΥΝΕΔΡΙΑ

**“LC–HRMS SUSPECT SCREENING WORKFLOW TO
ELUCIDATE TRANSFORMATION
PRODUCTS OF LINCOMYCIN AFTER
PHOTOCATALYTIC ABATEMENT USING
MOF-BASED PHOTOCATALYSTS”**

D. Lambropoulou^{1,2}

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ORAL PRESENTATION



UV-LEACH



«ΕΡΕΥΝΑ – ΔΗΜΙΟΥΡΓΙΑ – ΚΑΙΝΟΤΟΜΩ»
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ΕΣΠΑ
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Διαδύμα
ΔΙΑΧΡΗΜΑΤΙΣΤΙΚΟ ΣΥΣΤΗΜΑ

ΕΛΛΗΝΙΚΟ
ΑΝΟΙΚΤΟ
ΠΑΝΕΠΙΣΤΗΜΙΟ

Υβριδικό Μοντέλο Επεξεργασίας στραγγισμάτων ΧΥΤΑ

ΔΗΜΟΣΙΕΥΣΕΙΣ

10 δημοσιεύσεις

Σε έγκριτα διεθνή επιστημονικά περιοδικά

Available Online for the Environment 3 (2022) 100020

Contents lists available at ScienceDirect

Sustainable Chemistry for the Environment

Journal homepage: www.elsevier.com/locate/scenv

Photo-catalytic degradation of the antidepressant drug bupropion. Performance, water matrix effect and identification of transformation products

Eleni Drosopoulou¹, Anthoni Pappas¹, Leokadia Athanasiou Kouroukou^{1,2}, Dinaia Panagoulou^{1,3}, Dimitris Lambropoulos^{1,4,5}, Dinaia Panagoulou^{1,3}, Dinaia Panagoulou^{1,3}

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ARTICLE INFO

Keywords: Bupropion; Antidepressant; Photo-catalysis; Water matrix; Transformation products

ABSTRACT

The photo-catalytic degradation of the antidepressant drug bupropion (BP) was studied using TiO₂ as catalyst. Complete removal of the target compound is achieved within 60 min of exposure and the effect of various operational parameters like the reaction time, the initial concentration of the drug or the pH of the treated solution, have been evaluated. The influence of various parameters on organic contaminants easily present in natural water like chloride or nitrate ion and their acidic counterparts, was also investigated revealing a negative impact on the photo-catalytic degradation process. Accordingly, the degradation of BP was also evaluated in different water matrices like wastewater effluent or leachate exhibiting slower degradation kinetics. Finally, employing high-resolution mass spectrometry, 20 transformation products (TPs) have been identified 24 out of which have been proposed for the first time.

1. Introduction

Pharmaceutically active compounds and personal care products (PPCPs) are used by humans as well as animals and are consequently widespread but also harmful substances in the form of contaminants, into aquatic environments. However, these chemicals are not introduced in the environment only as a result of human and animal consumption, but also as residues from manufacturers and hospitals [1]. This is attributed to the fact that after their release into wastewater treatment systems and based on the chemical structure of the compounds, the majority of them are not eliminated by the usual biological activity employed in conventional sewage treatment plants, which are designed as major source of PPCPs into surface water systems [2]. Consequently, a number of studies have reported trace amounts of pharmaceuticals [3] or their transformation products in large number of semi-remote natural waters [4].

Multi-resistant and hard-to-pharmaceutical products that do not degrade and are firm biomass (in the treatment of depression, anxiety and chronic pain) and are recommended for animals to treat equine anxiety, are frequently prescribed and usually for a long

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molecules

Article

Incorporation of Metal-Based Nanoadditives into the PLA Matrix: Effect of Surface Properties on Antibacterial Activity and Mechanical Performance of PLA Nanoadditive Films

Klerynna Poulia-Courea^{1,*}, Alexandra Andoua², Dimitrios N. Nikolettos^{3,4}, Dinaia Lambropoulos^{1,5}, Katja Kuzmic¹ and Lidija Fua Zemanjic^{1,6}

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Abstract: In this work, the modification process of poly(lactic acid) (PLA) with metal-based nanoparticles (NPs) additives (Ag, ZnO, TiO₂) at different loadings (0.5, 1.0 and 1.5 wt%) and by matrix entrapment method followed by film formation as one of the advanced techniques for industrial application have been investigated. PLA nanoparticles composite films (PLA-NPs) of PLA, Ag, ZnO, TiO₂ (PLA-TPCs) were fabricated, allowing convenient dispersion of NPs within the PLA matrix to further explore the challenge of investigating the surface properties of PLA. No mechanical plasticity (strain) for the final functional properties, such as antimicrobial activity and surface mechanical properties, was affected by the addition of NPs to the PLA during the matrix entrapment process as well as the chemical, morphological and wettability of the surface and its further reflection on the antibacterial efficacy and mechanical properties of the PLA-NPs. Therefore, the effect of Ag, ZnO, and TiO₂ NPs incorporation on the morphology (SEM), elemental mapping analysis (EDS-EDX), roughness, surface free energy (SFE) of PLA-NPs measured by geometry and calculated by Wenzel, Owens, Wendt, Rhee, and Li and Koel model was evaluated and correlated with the final functional properties such as antimicrobial activity and surface mechanical properties. The developed PLA-metal-based nanocomposites, with improved mechanical and antimicrobial surface properties, could be used as sustainable and biodegradable materials, offering acceptable multifunctionalities not only for food packaging but also for cosmetics and hygienic products, as well as for broader plastic products when antimicrobial activity is desirable.

Keywords: poly(lactic acid); nanoparticles; composite additive films; SEM analysis; surface free energy calculation; antibacterial activity; nanomodification

1. Introduction

The development of plastic packaging materials is an extremely thriving area of research that has driven rapid growth in recent years. The focus is on the improvement of materials, which, on the one hand, protect the product and extend its life, and on the other hand, have a biodegradable and functional aspect. In this regard, petroleum-based plastics such as polyethylene (PE), polypropylene (PP), polystyrene (PS) have experienced exponential growth every year due to the easy availability, low cost, good barrier, and mechanical properties for packaging. Despite their good properties, the mechanical growth

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Science of the Total Environment 904 (2022) 165999

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Science of the Total Environment

Journal homepage: www.elsevier.com/locate/scotenv

Photo-assisted transformation of furosemide: Exploring transformation pathways, structure database and suspect and non-target workflows for comprehensive screening of unknown transformation products in wastewater and landfill leachate

Leokadia Athanasiou Kouroukou^{1,3}, Christina Nounou¹, Eleni Drosopoulou^{1,3}, Dinaia Panagoulou^{1,3}, Dinaia Panagoulou^{1,3}, Dinaia Panagoulou^{1,3}

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³Department of Pediatrics, NYU Grossman School of Medicine, NY 10016USA, New York, USA

HIGHLIGHTS

- Antimicrobial, biodegradability and leachate formation are major transformation routes.
- 25 newly proposed TPs were identified using MS/MS data and an optimized workflow.
- 3 IT models provided additional confirmation for proposed structures of 38 TPs.
- Coexistence of new TPs in wastewater with potential ecotoxicological implications.
- Workflow-based retrospective analysis in wastewater revealed the presence of 6 TPs.

ARTICLE INFO

Keywords: Furosemide; Biodegradation; Wastewater; Ecotoxicology; MS/MS

GRAPHICAL ABSTRACT

ABSTRACT

In recent years, transformation products (TPs) of pharmaceuticals in the environment have received considerable attention. In this context, here, a controlled conversion of Furosemide (FRO) in aqueous matrices treated by photo-oxidation is provided as a proof of concept. Hence, the primary goal of the study was to display an integrated strategy for monitoring the target (parent molecular and suspect screening (SS) approaches (TPs) in order to build an inclusive high-resolution mass spectrometry (HRMS) database able to provide reference information (cheminformatics/spectra) for environmental investigations in complex matrices (wastewater/landfill leachate). Our analysis was performed by optimizing a SS workflow. Additional confirmation for the proposed structural elucidation was provided by comparing retention time to the proposed structure depicting low prediction models. This approach was applied for the tentative identification of 25 TPs of FRO, 20 of which are reported herein for the first time. Finally, 10 and non-target analysis (NTA) have been

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UV-LEACH

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Β' ΚΥΚΛΟΣ

UV-LEACH



Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης



WORKSHOPS

Tuesday, July 25th 2023

Program

- 13:00 – 13:10 Welcome-Introduction of UV-Leach project**
Assoc. Prof. Petros Kokkinos, School of Science & Technology, Hellenic Open University
- 13:10 – 13:25 Planning, Construction and Operation of the Advanced Oxidation Process (AOP) Unit**
Katerina Filiou, Environmental Control Service, EDADYM S.A.
- 13:25 – 13:40 The Integrated Waste Management System in Western Macedonia and Environmental Evaluation of Leachate Treatment in UV-LEACH**
Dr. Kyriaki Sakellariou, Chemical Engineer MSc., DIADYMA S.A.
- 13:40 – 13:55 Immobilization of TiO₂ and magnetic Fe₃O₄-TiO₂ onto polymeric matrices: an insight into synthesis, characterization and application for the photocatalytic removal of organic contaminants**
Nina Ainali, Candidate PhD, Department of Chemistry, KEDEK, AUTH
- 13:55 – 14:10 Landfill leachate treatment by applying homogeneous oxidative systems (AOPs)**
Pericles Parthenidis, Candidate PhD, Department of Chemistry, KEDEK, AUTH
- 14:10 – 14:25 Reuse of treated Leachates in Agriculture**
Dr. Ekavi Isari, School of Science and Technology, Hellenic Open University

Discussion



UV-LEACH

Integration Methodology for Landfill Leachate Treatment by using a hybrid System based on Ultraviolet Processes Advanced Oxidation Processes (AOPs) and Membrane Technology



«ΕΡΕΥΝΑ – ΔΗΜΙΟΥΡΓΩ – ΚΑΙΝΟΤΟΜΩ»
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UV-LEACH



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
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Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης



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Διαδύμα
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Υβριδικό Μοντέλο Επεξεργασίας στραγγισμάτων ΧΥΤΑ

ΗΜΕΡΙΔΕΣ

2 Υβριδικές Ημερίδες

Για τη διάχυση των αποτελεσμάτων του έργου



Δελτίο Τύπου

Με ιδιαίτερη επιτυχία πραγματοποιήθηκε την Τρίτη 19 Ιουλίου 2022 Διεπιστημονικό Επιμορφωτικό Σεμινάριο στο πλαίσιο του έργου UV-LEACH με τίτλο «Τεχνολογίες Επεξεργασίας Υγρών Αποβλήτων, Προχωρημένες Οξειδωτικές Μέθοδοι - Σύνθεση νέων Φωτοκαταλυτικών Υλικών - Αναλυτικές Τεχνικές - Δοκιμίες Τοξικότητας - Επαναχρησιμοποίηση Λυμάτων». Το σεμινάριο διοργανώθηκε από το τμήμα Χημείας του ΑΠΘ, σε συνεργασία με ΔΙΑΔΥΜΑ ΑΕ, τη Σχολή Θετικών Επιστημών και Τεχνολογίας του ΕΑΠ και την ΕΔΑΔΥΜ. Το σεμινάριο παρακολούθησαν φοιτητές, ερευνητές αλλά και συνεργάτες που εργάζονται σε συναφή ερευνητικά αντικείμενα.



Στο σεμινάριο πραγματοποιήθηκαν ομιλίες από τους εταίρους με θεματολογία:

- ✓ Η περιγραφή των στόχων και των δράσεων του έργου
- ✓ Ολοκληρωμένο Σύστημα Διαχείρισης Απορριμμάτων (ΟΣΔΑ) Δυτικής Μακεδονίας
- ✓ Έλεγχος επαναχρησιμοποίησης των επεξεργασμένων στραγγισμάτων σε εδάφη
- ✓ Στρατηγικές επεξεργασίας στραγγισμάτων και λυμάτων υψηλού ρυπαντικού φορτίου με τη χρήση Προχωρημένων Οξειδωτικών Μεθόδων Αντιρροπήσεως
- ✓ Σύνθεση νέων φωτοκαταλυτικών υλικών και εφαρμογές τους
- ✓ Προσδιορισμός ρύθμων στα στραγγίσματα με χρήση Φασματομετρίας Μάζας Υψηλής Διακριτικής Ικανότητας και εκτίμηση της τοξικότητας τους

Υπήρξε εξαιρετικά μεγάλο Υπήρξε εξαιρετικά μεγάλο ενδιαφέρον και ως εκ τούτου οι εταίροι και τα ενδιαφέροντα μέλη ανανέωσαν το ραντεβού τους σε μία πιθανή δια ζώσης συνάντηση σε επόμενη εκδήλωση του έργου. Για περισσότερες πληροφορίες του έργου μπορείτε να επισκεφθείτε την επίσημη ιστοσελίδα του <http://uv-leach.chem.auth.gr/>



UV-LEACH



«ΕΡΕΥΝΩ – ΔΗΜΙΟΥΡΓΩ – ΚΑΙΝΟΤΟΜΩ»
Β' ΚΥΚΛΟΣ



UV-LEACH



ΕΛΛΗΝΙΚΟ ΑΝΟΙΚΤΟ ΠΑΝΕΠΙΣΤΗΜΙΟ
ΑΝΑΛΥΤΙΚΩΣ ΚΑΙ ΕΠΙΣΤΗΜΟΝΩΣ

ΕΠΑΝΕΚ 2014-2020
ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ
ΔΙΑΤΑΞΗΣ ΤΩΝ ΠΡΟΤΥΠΩΝ
ΕΡΕΥΝΑΣ ΚΑΙ ΚΑΙΝΟΤΟΜΙΑΣ

ΕΣΠΑ
2014-2020

Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης



ΤΜΗΜΑ ΧΗΜΕΙΑΣ
ΑΡΙΣΤΟΤΕΛΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΟΝΙΚΗΣ

ΚΕΔΕΚ
ΚΕΝΤΡΟ ΕΡΕΥΝΑΣ ΚΑΙ ΔΙΑΧΕΙΡΙΣΗΣ ΚΑΙΝΟΤΟΜΩΝ



Διαδύμα
ΑΚΑΔΗΜΙΑ ΔΙΟΙΚΗΤΙΚΗΣ ΚΑΙ ΟΙΚΟΝΟΜΙΚΗΣ ΕΡΕΥΝΑΣ

ΕΛΛΗΝΙΚΟ ΑΝΟΙΚΤΟ ΠΑΝΕΠΙΣΤΗΜΙΟ

