

Environmental Science Water Research & Technology

rsc.li/es-water

The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

IN THIS ISSUE

ISSN 2053-1400 CODEN ESWRAR 9(12) 3079–3498 (2023)



Cover

See Hongtao Zhao,
Xuyong Li et al.,
pp. 3146–3157.
Image reproduced by
permission of Hongtao Zhao
from *Environ. Sci.: Water Res.
Technol.*, 2023, 9, 3146.



Inside cover

See Robert Furén et al.,
pp. 3158–3173.
Image reproduced by
permission of Robert Furén
from *Environ. Sci.: Water Res.
Technol.*, 2023, 9, 3158.

THEMED ISSUE ARTICLES

EDITORIAL

3091

Urban stormwater management

Luca Vezzaro,* Nathalie Gilbert, Lian Lundy,
María Nariné Torres Cajiao and Kefeng Zhang

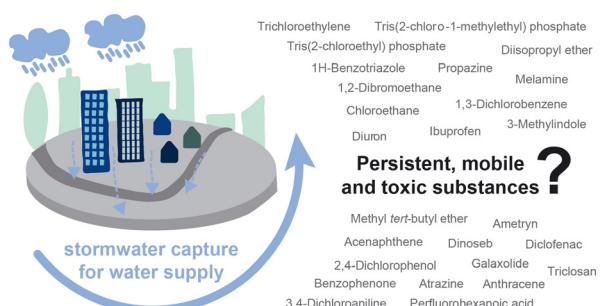


FRT

3094

Urban stormwater capture for water supply: look out for persistent, mobile and toxic substances

Lena Mutzner,* Kefeng Zhang, Richard G. Luthy,
Hans Peter H. Arp and Stephanie Spahr*



Environmental Science Water Research & Technology

rsc.li/es-water

Environmental Science: Water Research & Technology seeks to showcase high quality research about fundamental science, innovative technologies, and management practices that promote sustainable water.

Editorial Board

Editor-in-Chief

Graham Gagnon, Dalhousie University, Canada

Members

Takahiro Fujioka, Nagasaki University, Japan
Xia Huang, Tsinghua University, China
Karin Jönsson, Lund University, Sweden
Branko Kerkez, University of Michigan, USA
Jeonghwan Kim, Inha University, South Korea
Linda Lawton, Robert Gordon University, UK
Luca Vezzaro, Technical University of Denmark, Denmark
Eveline Volcke, Ghent University, Belgium

Associate Editors

Sébastià Puig Broch, Universitat de Girona, Spain
Wenhai Chu, Tongji University, China
Lauren Stadler, Rice University, USA
Liu Ye, The University of Queensland, Australia

Advisory Board

Nicholas Ashbolt, University of Alberta, Canada
Federico Aulenta, National Research Council, Italy
Tom Bond, University of Surrey, UK
Joby Boxall, The University of Sheffield, UK
Kartik Chandran, Columbia University in the City of New York, USA
Amy Childress, University of Southern California, USA
David M. Cwiertny, University of Iowa, USA
Dionysios Dionysiou, University of Cincinnati, USA
Joel Ducoste, North Carolina State University, USA
Marc Edwards, Virginia Tech, USA
Jingyun Fang, Sun Yat-Sen University, China
Maria José Farré, Catalan Institute for Water Research, Spain
Yujie Feng, Harbin Institute of Technology, China
Kathrin Fenner, Swiss Federal Institute of Aquatic Science and Technology, Eawag, Switzerland
Ramesh Goel, University of Utah, USA
Ola Gomaa, National Center for Radiation Research and Technology, Egypt
Chris Gordon, University of Ghana, Ghana
April Gu, Cornell University, USA
Jochen Hack, Leibniz Universität Hannover, Germany
Zhen "Jason" He, Washington University in St. Louis, USA

Cynthia Joll, Curtin University, Australia
Tamar Kohn, École Polytechnique Fédérale de Lausanne, Switzerland
Tove Larsen, Swiss Federal Institute of Aquatic Science and Technology, Eawag, Switzerland
Peng Liang, Tsinghua University, China
Irene Lo, Hong Kong University of Science and Technology, Hong Kong, China
Julie Minton, The Water Research Foundation, USA
Vincenzo Naddeo, University of Salerno, Italy
Indumathi M Nambi, Indian Institute of Technology Madras, India
Long Nghiem, University of Technology Sydney, Australia
Paige Novak, University of Minnesota, USA
Yong Sik Ok, Korea University, South Korea
Ligy Philip, IIT Madras, India
Thalappil Pradeep, Indian Institute of Technology Madras, India
Zhiyong "Jason" Ren, Princeton University, USA
Peter Robertson, Queen's University Belfast, UK
Michael Templeton, Imperial College London, UK
Kai Uder, Swiss Federal Institute of Aquatic Science and Technology, Switzerland
Subramanyan Vasudevan, CSIR-Central Electrochemical Research Institute, Karaikudi, India
Luca Vezzaro, Technical University Denmark, Denmark

Ajie Wang, Research Center for Eco-Environmental Sciences, China
Xin Wang, Nankai University, China
David Weissbrodt, TU Delft, The Netherlands
Krista Wigginton, University of Michigan, USA
Di Wu, Ghent University, South Korea
Defeng Xing, Harbin Institute of Technology, China
Jeyong Yoon, Seoul National University, South Korea

Information for Authors

Full details on how to submit material for publication in *Environmental Science: Water Research & Technology* are given in the Instructions for Authors (available from <http://www.rsc.org/authors>). Submissions should be made via the journal's homepage: rsc.li/es-water

Authors may reproduce/republish portions of their published contribution without seeking permission from the Royal Society of Chemistry, provided that any such republication is accompanied by an acknowledgement in the form: (Original Citation)–Reproduced by permission of the Royal Society of Chemistry.

This journal is © The Royal Society of Chemistry 2023. Apart from fair dealing for the purposes of research or private study for non-commercial purposes, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988 and the Copyright and Related Rights Regulation 2003, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the publishers or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK. US copyright law is applicable to users in the USA.

Registered charity number: 207890

Editorial Staff

Executive Editor

Neil Scriven

Deputy Editor

Grace Thoburn

Development Editor

Nour Tanbouza

Editorial Production Manager

Claire Darby

Publishing Editors

Emma Carlisle, Hannah Hamilton, Ephraim Otumudia, Irene Sanchez Molina Santos, Michael Spencelayah, Callum Woof, Lauren Yarrow-Wright

Editorial Assistant

Kate Bandoo

Publishing Assistant

Linda Warneke

Publisher

Sam Keltie

For queries about submitted papers please contact Claire Darby, Editorial Production Manager, in the first instance. E-mail: eswater@rsc.org

For pre-submission queries please contact Neil Scriven, Executive Editor. E-mail: eswater-rsc@rsc.org

Environmental Science: Water Research & Technology (electronic: ISSN 2053-1419) is published 12 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

All orders, with cheques made payable to the Royal Society of Chemistry, should be sent to the Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK
Tel +44 (0)1223 432398; E-mail orders@rsc.org

2023 Annual (electronic) subscription price: £1881; US\$3103. Customers in Canada will be subject to a surcharge to cover GST. Customers in the EU subscribing to the electronic version will be charged VAT.

If you take an institutional subscription to any Royal Society of Chemistry journal you are entitled to free, site-wide web access to that journal. You can arrange access via Internet Protocol (IP) address at www.rsc.org/ip

Customers should make payments by cheque in sterling payable on a UK clearing bank or in US dollars payable on a US clearing bank.

Whilst this material has been produced with all due care, the Royal Society of Chemistry cannot be held responsible or liable for its accuracy and completeness, nor for any consequences arising from any errors or the use of the information contained in this publication. The publication of advertisements does not constitute any endorsement by the Royal Society of Chemistry or Authors of any products advertised. The views and opinions advanced by contributors do not necessarily reflect those of the Royal Society of Chemistry which shall not be liable for any resulting loss or damage arising as a result of reliance upon this material. The Royal Society of Chemistry is a charity, registered in England and Wales, Number 207890, and a company incorporated in England by Royal Charter (Registered No. RC000524), registered office: Burlington House, Piccadilly, London W1J 0BA, UK, Telephone: +44 (0) 207 4378 6556.

Advertisement sales:

Tel +44 (0) 1223 432246; Fax +44 (0) 1223 426017;
E-mail advertising@rsc.org

For marketing opportunities relating to this journal, contact marketing@rsc.org

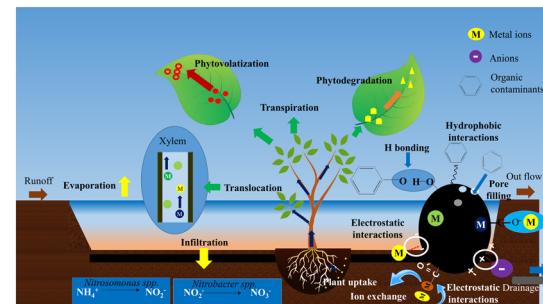


CRITICAL REVIEWS

3103

Biofilters and bioretention systems: the role of biochar in the blue-green city concept for stormwater management

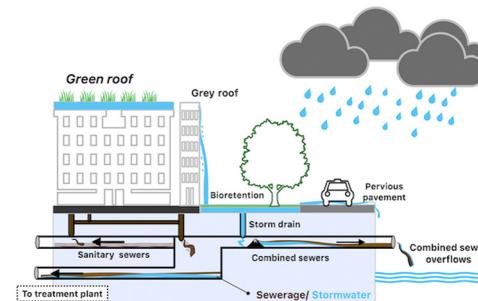
K. S. D. Premarathna, Jayanta Kumar Biswas, Manish Kumar, Sunita Varjani, Bede Mickan, Pau Luke Show, Sie Yon Lau, Luís A. B. Novo and Meththika Vithanage*



3120

Modeling the hydrological benefits of green roof systems: applications and future needs

Zhaokai Dong, Daniel J. Bain, Kimberly A. Gray, Murat Akcakaya and Carla Ng*

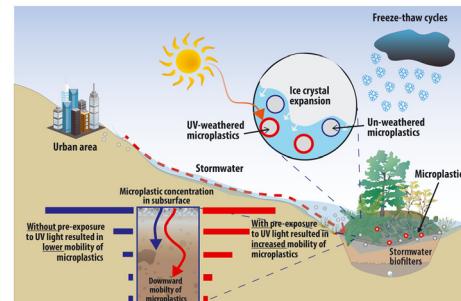


COMMUNICATION

3136

UV exposure to PET microplastics increases their downward mobility in stormwater biofilters undergoing freeze-thaw cycles

Haley J. Gunther, Tonoy K. Das, Jamie Leonard, Vera S. Koutnik, Lea A. El Rassi, Zilong Tang and Sanjay K. Mohanty*

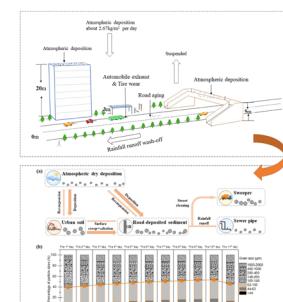


PAPERS

3146

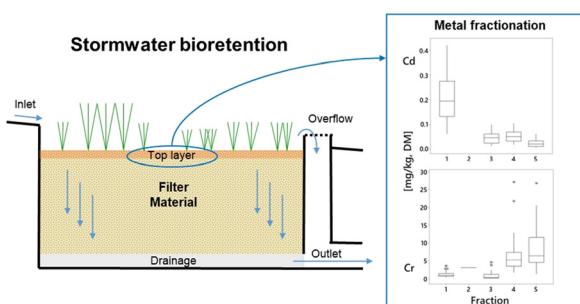
Role of height and position in the vertical distribution pattern of urban surface-deposited sediments and associated heavy metals

Hongtao Zhao,* Tian Huang, Jingjun Su and Xuyong Li*



PAPERS

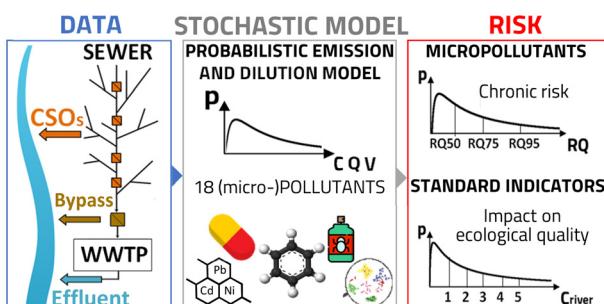
3158



Concentration, distribution, and fractionation of metals in the filter material of 29 bioretention facilities: a field study

Robert Furén,* Hélène Österlund, Ryan J. Winston, R. Andrew Tirpak, Jay D. Dorsey, Joseph Smith, Maria Viklander and Godecke-Tobias Blecken

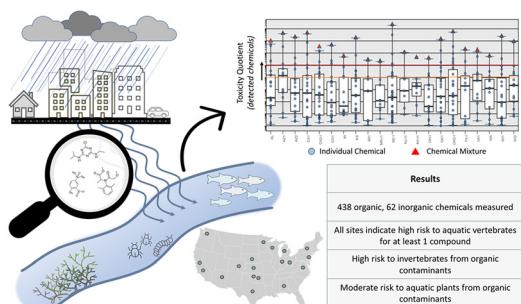
3174



A stochastic approach for assessing the chronic environmental risk generated by wet-weather events from integrated urban wastewater systems

Jessica Ianes, Beatrice Cantoni, Enrico Ulisse Remigi, Fabio Polesel, Luca Vezzaro and Manuela Antonelli*

3191



Predicted aquatic exposure effects from a national urban stormwater study

Paul M. Bradley,* Kristin M. Romanok, Kelly L. Smalling, Jason R. Masoner, Dana W. Kolpin and Stephanie E. Gordon

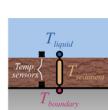
3200

Heat transfer analysis and Temperature measurements

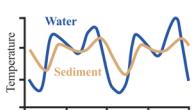


Monitoring urban drainage sediment accumulation

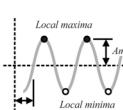
Conceptualization and lab-scale experiments



Liquid and sediment-bed temperature time series



Features characterization from daily patterns



Sediment thickness estimation models (training and testing)



Towards urban drainage sediment accumulation monitoring using temperature sensors

Manuel Regueiro-Picallo,* Jose Anta, Acacia Naves, Alejandro Figueroa and Jörg Rieckermann

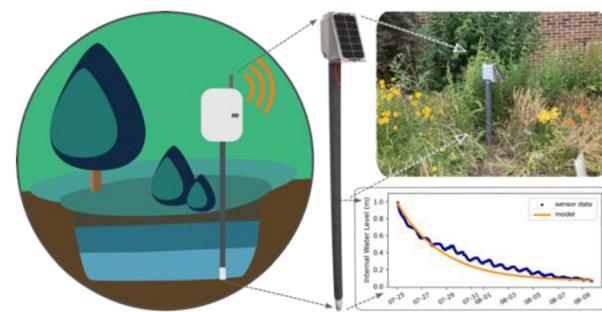


PAPERS

3213

Measuring city-scale green infrastructure drawdown dynamics using internet-connected sensors in Detroit

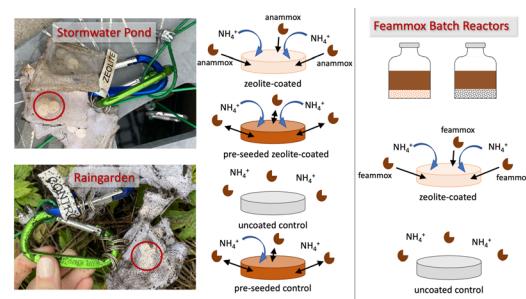
Brooke E. Mason,* Jacquelyn Schmidt and Branko Kerkez



3227

Stormwater applications of zeolite-coated biofilm carriers for ammonium removal with possible applications to PFAS biotransformation

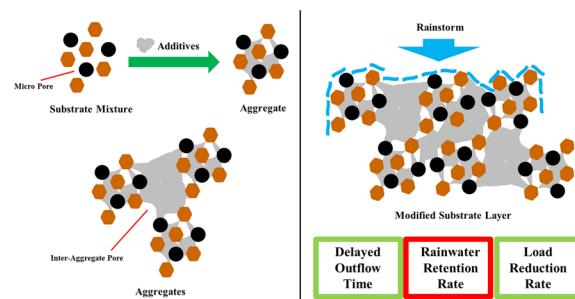
Anndee L. Huff Chester,* Noah Gallagher, Shan Huang, Peter R. Jaffé and Paige J. Novak*



3243

Comparison of rainwater management performance of modified extensive green roof substrate layer with different additives in rainstorm events

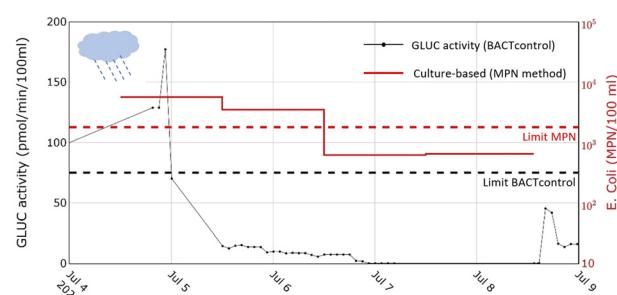
Yiming Fei, Chen Xu, Shujiang Miao, Dafang Fu and Junyu Zhang*



3257

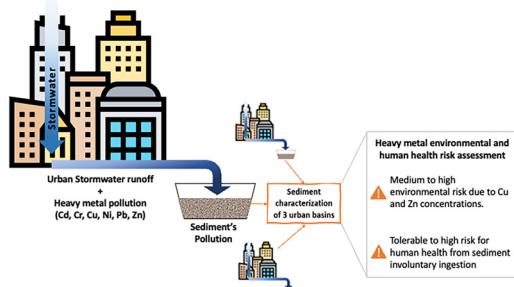
The potential of near real-time monitoring of β -D-glucuronidase activity to establish effective warning systems in urban recreational waters

Konstantinos F. Makris,* Bas Hoefijzers, Laura Seelen, Remy Schilperoort and Jeroen G. Langeveld



PAPERS

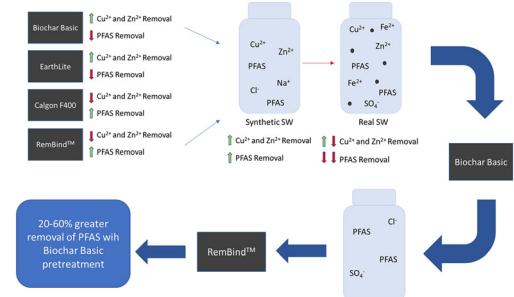
3269



Urban stormwater sediment risk assessment from drainage structures in Bogotá, Colombia

María Alejandra Pimiento,* Verónica Duque and Andres Torres

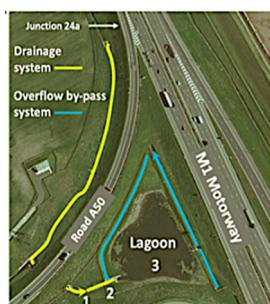
3281



Evaluation of sorbents and matrix effects for treating heavy metals and per- and polyfluoroalkyl substances as co-contaminants in stormwater

Bethany A. Parker, Casey A. Kanałos, Tyler S. Radniecki, Staci L. Massey Simonich and Jennifer A. Field*

3290



Metal distribution in first flush in highway runoff of one of the busiest motorway junctions in the UK

Julia Zakharova,* Hamid Pouran and Andrew Wheatley

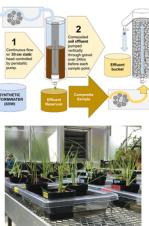
3302

Stormwater Subsurface Gravel Wetlands

2-year field study



Lab studies



Results:

- ✓ Peak flow & volume reductions
- ✗ Poor P removal driven by P export from soil layer
- ✗ Negligible impacts on chloride transport
- ✗ Cl⁻ suppression of growth for 1 of 2 plant species tested

Stormwater subsurface gravel wetland hydraulics, phosphorus retention, and chloride dynamics in cold climates

Eric D. Roy,* Andres O. Torizzo, Marcos L. Kubow, Nisha C. Nadkarni, Thomas M. Adler, Madeline F. Yandow, Finn A. Bondeson, Adrian R. H. Wiegman and Donna M. Rizzo



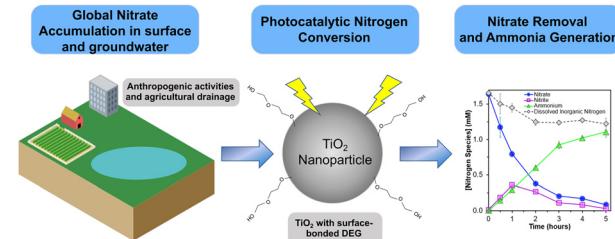
REGULAR ARTICLES

COMMUNICATION

3318

Photochemical conversion of nitrate to ammonium ions by a newly developed photo-reductive titanium dioxide catalyst: implications on nitrogen recovery

Andrew Sanchez, Zuyang Ye, Yadong Yin and Haizhou Liu*

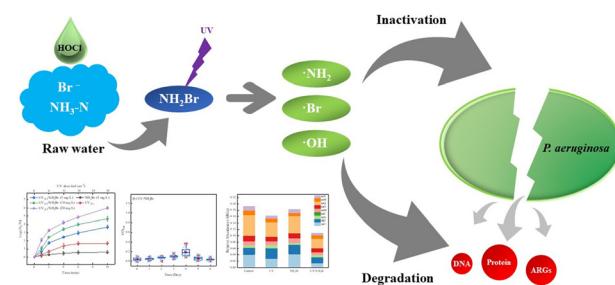


PAPERS

3325

Unveiling a potential disinfection process in ultraviolet treatment of bromine-containing water: inactivation of *P. aeruginosa* in a UV/NH₂Br system

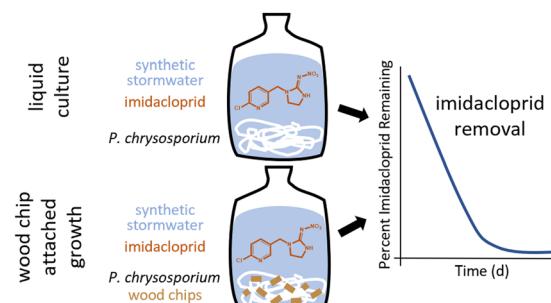
Shumin Zhu, Jingxuan Yang, Yangtao Wu, Da Sheng,* Lingjun Bu and Shiqing Zhou



3333

Degradation of imidacloprid by *Phanerochaete chrysosporium* on wood chips for stormwater treatment

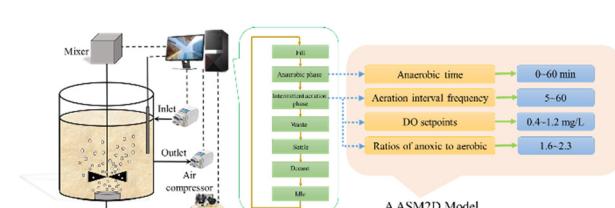
Leah M. M. Weaver, Nancy Lee Alexander, Marc A. Cubeta, Detlef R. U. Knappe and Tarek N. Aziz*



3344

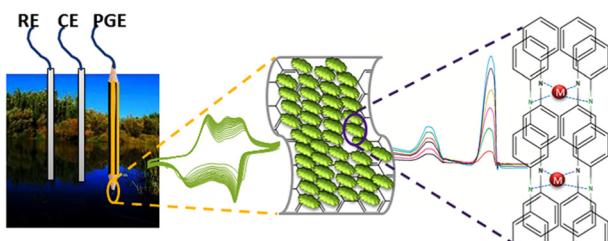
Functional guild dynamics in a single-sludge shortcut nitrogen and phosphorus removal reactor: a modeling study

Quan Yuan, Zhen Jia, Paul Roots, Fabrizio Sabba and George Wells*



PAPERS

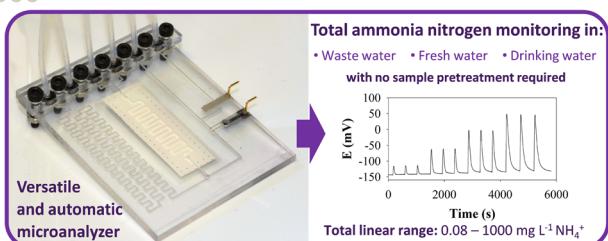
3355



Simultaneous determination of Cd and Pb in the environment using a pencil graphite electrode modified with polyaniline/graphene oxide nanocomposite

Sima Pourbeyram,* Soghra Fathalipour, Bahaaldin Rashidzadeh, Hananeh Firuzmand and Behnaz Rahimi

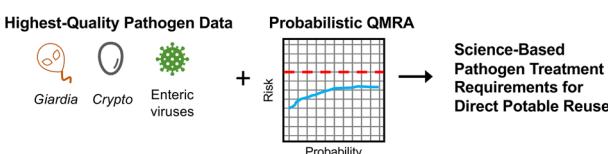
3366



Highly versatile and automated total ammonia nitrogen compact analyzer suitable for different types of water samples

Antonio Calvo-López, Julián Alonso-Chamarro and Mar Puyol*

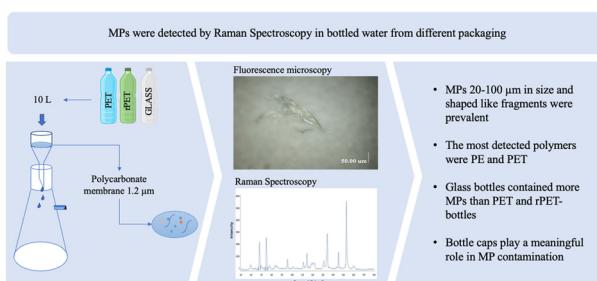
3377



Science-based pathogen treatment requirements for direct potable reuse

Brian M. Pecson,* Anya Kaufmann,* Daniel Gerrity, Charles N. Haas, Edmund Seto, Nicholas J. Ashbolt, Theresa Slifko, Emily Darby and Adam Olivier

3391



Characterization of microplastics in water bottled in different packaging by Raman spectroscopy

Isabella Gambino, Cosimino Malitestra, Francesco Bagordo, Tiziana Grassi, Alessandra Panico,* Silvia Fraissinet, Antonella De Donno and Giuseppe Egidio De Benedetto

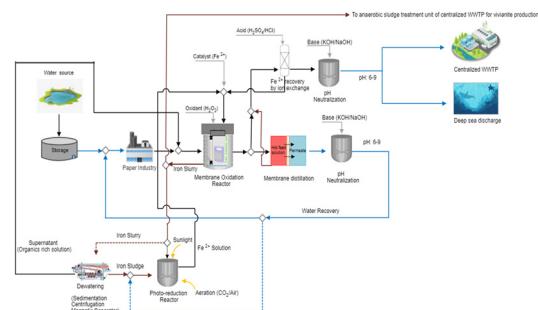


PAPERS

3398

Eco-sustainable paper wastewater management by water-resource recovery and concentrate minimization using a membrane oxidation reactor and membrane distillation system

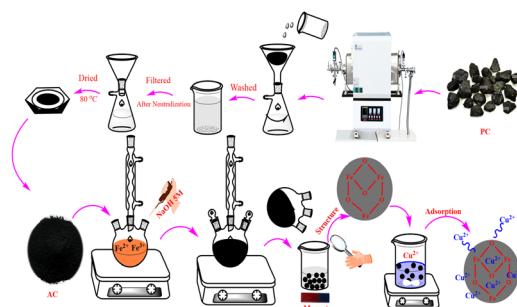
Esra Can Dogan,* Elif Durna Pişkin, Ali Oguzhan Narci, Berna Kiril Mert, Sevgi Topcu Yakın, Tugba Nur Demirözü, Mine Selin Atasoy and Coskun Aydiner*



3417

Performance improvement of pyrolytic coke by surface modification for the adsorption of copper(II) ions from wastewater

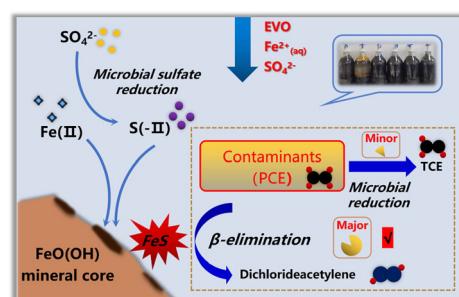
Behrad Barzegar, Seyed Jamaleddin Peighambardoust,* Hassan Aghdasinia* and Rauf Foroutan



3435

Effect of enhanced biogeochemical transformation of tetrachloroethylene by EVO-FeSO₄ and its transport characteristics in aquifers

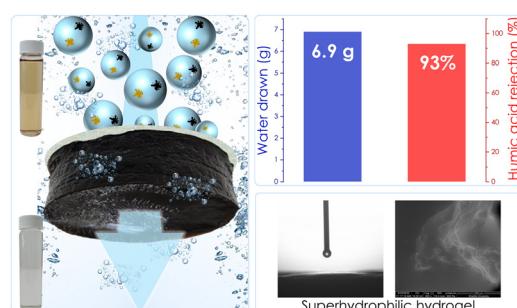
Chen Sun, Minglu Sun, Xue Liang, Yanyang Mo and Jun Dong*

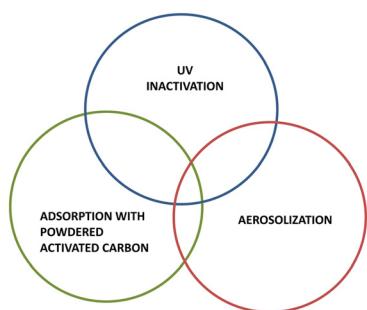


3446

Graphene oxide/alginate/polyacrylate hydrogels as a draw agent for osmosis water purification

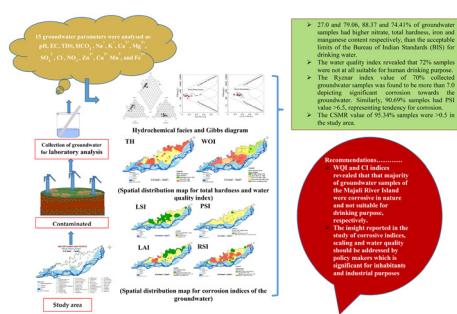
Adetunji Alabi and Linda Zou*





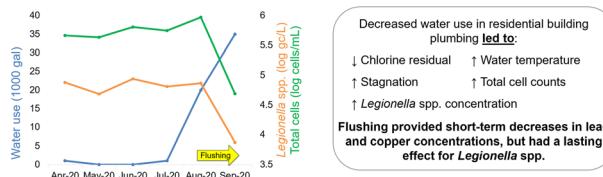
Characterizing *Bacillus globigii* as a *Bacillus anthracis* surrogate for wastewater treatment studies and bioaerosol emissions

Leigh Durden, Kyle Eckhoff, Adam C. Burdsall, Sungmin Youn, Cindy Andújar-Gonzalez, Lubna Abu-Niaaj, Matthew Magnuson and Willie F. Harper Jr.*



Assessment of the hydrogeochemistry of shallow water aquifers using corrosion indices and geospatial techniques in the regions of the Brahmaputra river basin, India

Gulshan Kumar Sharma,* Roomesh Kumar Jena, Pravash Chandra Moharana, Prasenjit Ray, Shakir Ali, Krishna Kumar Mourya and Bachaspati Das



Water quality during extended stagnation and flushing in a college residential hall

Danielle M. Angert, Christian Ley, Kyungyeon Ra, Yoorae Noh, Nadezhda Zyaykina, Elizabeth Montagnino, Ruth Wei, Andrew J. Whelton and Caitlin R. Proctor*

