Water Research Center
Tel Aviv University

The Water Research Center News
"Qwaterly"
1st Issue | May 2018

For more details visit us on our new website:
https://en-wrc.tau.ac.il/

ABOUT US: The Water Research Center (WRC) at Tel Aviv University (TAU) was established by the head of the center, Prof. Dror Avisar, in 2015. Research focuses on water and wastewater, a field that is of central and vital importance to water sectors worldwide. The center serves as a fertile ground and hub of knowledge, a 'living laboratory' of sorts, for studies in this field. The center coordinates all associated researchers in the various faculties at TAU who are interested in our vision, promotes research activities, and encourages scientific collaborations with international academic institutes and industry. The WRC is in the process of enhancing its manpower, scientific equipment and laboratories at TAU, and establishing a pilot-scale demonstration facility. Clearly, there is a need for more research, as well as for the implementation of innovative technologies.

OUR RESEARCH ACTIVITIES at the WRC focus on the following subjects: photolysis and oxidation of hospital and industrial wastewater via biological treatment, such as membrane bioreactors (MBR) coupled with advance oxidation processes (AOP) systems; exploring mechanisms, fate and transport of micro- and nanopollutants and their degradation products in the aquatic environment; photolysis, including solar-driven photocatalytic activity of nitrogen-doped TiO2 nanostructured membranes and other photocatalysts, such as bismuth oxyhalides; hybrid AOP–soil aquifer treatment (SAT) technology for micropollutant removal, and enhanced biodegradation by ozonation of domestic secondary effluent followed by SAT; particle-shape analysis of water subjected to granular and membrane filtration and ozonation; solar disinfection of water using the synergy of solar UV radiation and heat; nanocolloidal particles to improve water quality; development of high-rate biofiltration systems for wastewater; recovery and reuse of drugs derived from wastewater cross-contamination of chemotherapeutic drugs; nano- and microplastic contamination; the development of innovative wastewater & drinking water systems and technologies, both high-tech and low-tech; regulation of pharmaceutical residues—evaluation and recommendations.

1ST NEWSLETTER: We are very excited to launch the 1st newsletter of the WRC at TAU. A "Qwaterly" will be issued every 3 months and will briefly summarize recent news, events and publications, as well as popular science articles from our ongoing research. In this issue, we present a solution that we have been working on to the big problem of wastewater contamination caused by the olive oil industry.
ENJOY!

Sincerely, Qwaterly

Treatment of olive mill wastewater (OMWW) using pre-ozonation followed by encapsulated acclimated biomass

Yeara Bar Oz, Hadas Mamane, Ofir Menashe, Vered Cohen-Yaniv, Eyal Kurzbaum

Olive oil mill wastewater (OMWW) is considered toxic industrial wastewater due to the presence of phytotoxic compounds and a high load of organic compounds. OMWW is characterized by a dark reddish-black color, mildly acidic pH, high contents of organic matter, and phytotoxic materials; it is mainly composed of sugars, tannins, pectins, polyphenols, polyalcohols and lipids. These compounds are persistent and therefore very difficult to treat by physical and chemical methods or biodegradation. The environmental impact of OMWW is a concern for both developing and developed countries. In this study, an ozonation pretreatment integrated with a fixed-biomass

Fig. 1. Local council 'Zemer', Israel, with a three phase extraction system

Porter School of the Environment and Earth Sciences
The Raymond and Beverly Sackler Faculty of Exact Sciences
Tel Aviv University
הפקולטה למדעים מדויקים ע"ש ריימונד ובברלי סאקלר
אוניברסיטת תל אביב
בית הספר לסביבה ולמדעי כדור הארץ על שם פורטר

biological treatment (small-bioreactor platform (SBP) capsule technology) was implemented to reduce phenolic compounds and organic matter in OMWW prior to discharge into a wastewater-treatment plant. Tannic acid (TA), a model synthetic phenol, was removed by up to 90% after ozonation and the biological treatment. The encapsulated biomass, Delftia EROSY, successfully degraded up to 1000 mg/L TA. Ozone pretreatment of TA expedited the biological process by decreasing its hydraulic retention time (HRT) of the biological process. Ozonation (ozone dose = 765 mg/L O3) of OMWW demonstrated 20% chemical oxygen demand (COD) and 61% total phenol (Tph) removal, with an additional increase to 36% COD removal after the biological treatment step (HRT = 48 h). Interestingly, spectral absorbance data constituted an important tool for process monitoring of ozonation followed by biological treatment of OMWW by encapsulated Delftia EROSY. Absorbance results clearly demonstrated that ozonation of OMWW, followed by biological treatment, is necessary to degrade not only phenolic compounds, but also phenol-transformation products and the high organic load of the OMWW following the ozonation step.

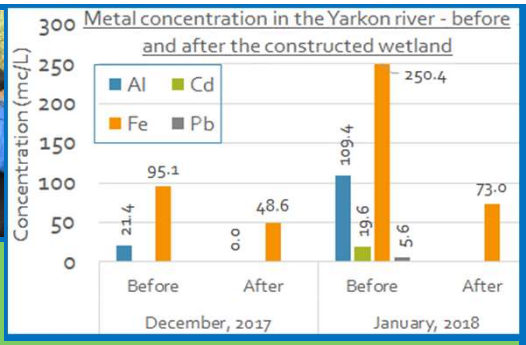
Conferences:

August 2017 – International Conference on Wastewater Management, Tamil Nadu, India

September 2017 – An international water conference "Cutting-Edge Solutions to Wicked Water Problems" was held at TAU, jointly convened by the WRC and the American Water Resources Association. The Center's director, Prof. Dror Avisar, served as conference co-chair together with Prof. Sharon Megdal, Director of the Water Resources Research Center at the University of Arizona

January 2018 – Isranalytica 2018 International Conference – The 21st Annual Meeting of the Israel Analytical Chemistry Society. Prof. Dror Avisar served as conference co-chair

September 2017 – Cutting-Edge Solutions to Wicked Water Problems



A research project: the effectiveness of the constructed wetland
On the left: educational tour in Yarkon park. On the right: results from December 2017-January 2018.

Educational project in the community:

In October 2017, we initiated an educational science program with "Singalovski", Ort Junior High School, on water quality. The selected group of children, expressing a desire for scientific excellence, joined a special once-weekly class as an enrichment program. The WRC team developed a special project framework and together with their teacher, Mr. Eyal Nachum, instructed the pupils through a scientific research experience.

Hot off the press:

Agricultural irrigation with effluent – What should we be worried about. December 2017. Ecology and Environment – Journal for Science and Environmental Policy 4, 8–55 (in Hebrew).

Formation and degradation of N-oxide venlafaxine during ozonation and biological post-treatment. 2018. Science of the Total Environment 619–620, 578–586.

Gene expression in Pseudomonas aeruginosa exposed to hydroxyl-radicals. 2018. Chemosphere 3(199), 243–250.

The Moshe Mirilashvili Institute:

The institute supports international collaborations and outstanding scientists:

Gokul D. Ph.D Exchange student from IIT Madras, India. A collaboration between WRC-TAU and Prof. Mohan from IIT Madras, lead to Gokul's exchange, during which time he focuses on Municipal leachate treatment by AOP.

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