

---

# **The 9th International Electronic Conference on Water Sciences**

**11–14 November 2025 | Online**



## Organizing Committee

### Conference Chair

Prof. Dr. Athanasios Loukas

### Conference Secretariat

Ass. Prof. Pantelis Sidiropoulos

### Session Chairs

Dr. Hossein Bonakdari  
Dr. Lampros Vasiliades  
Dr. Nikiforos Samarinis  
Dr. Qiang Liu  
Prof. Dr. Abbas Roozbahani  
Prof. Dr. Carmen Teodosiu  
Prof. Dr. Dapeng Li

Prof. Dr. Giuseppe Tito Aronica  
Prof. Dr. Guglielmina Diolaiuti  
Prof. Dr. Jianguo Zhou  
Prof. Dr. Luis Garrote  
Prof. Dr. Nicolò Colombani  
Prof. Dr. Pingping Luo  
Prof. Dr. Yanfang Sang

### Scientific Committee

Dr. Ankur Srivastava  
Dr. Barbara Ruffino  
Dr. Ben Jarihani  
Dr. Bommanna Krishnappan  
Dr. Fernando Salazar  
Dr. George Papaioannou  
Dr. Gianni Bellocchi  
Dr. Ioannis Panagopoulos  
Dr. Jiren Xu  
Dr. Joaquim Sousa  
Dr. José Manuel Monteiro Gonçalves  
Dr. Laura Bulgariu  
Dr. Michael Nones  
Dr. Mohd Soheb  
Dr. Mohsen Besharat  
Dr. Nelson Carriço  
Dr. Panagiota Galiatsatou  
Dr. Rajesh R. Shrestha  
Dr. Rana Waqar Aslam  
Dr. Ruth Quinn  
Dr. Santiago Zazo  
Dr. Seyed Mohammad Moein Sadeghi  
Dr. Stefanos Stefanidis  
Dr. Tania Mazzuca Sobczuk  
Dr. Wei Zhang  
Dr. Xin Pan

Dr. Yanfeng Wu  
Dr. Young Gu Her  
Dr. Yuxue Guo  
Professor Min Ji  
Professor Jr-chuan Huang  
Prof. Dr. Ali Güл  
Prof. Dr. Aris Psilovikos  
Prof. Dr. Ashok Vaseashta  
Prof. Dr. Bojan Đurin  
Prof. Dr. Carlo Gualtieri  
Prof. Dr. Dongfang Liang  
Prof. Dr. Enrico Creaco  
Prof. Dr. George Kargas  
Prof. Dr. Giovanni Esposito  
Prof. Dr. Hamed Assaf  
Prof. Dr. Ifigenia Kagalou  
Prof. Dr. Mohammed J. K. Bashir  
Prof. Dr. Muhammad Hameed  
Prof. Dr. Olcay Ünver  
Prof. Dr. Roger Falconer  
Prof. Dr. Silvio José Gumiere  
Prof. Dr. Vicente S. Fuertes-Miquel  
Prof. Dr. Vlassios Hrissanthou  
Prof. Dr. Wim Cornelis  
Prof. Dr. Xing Fang  
Prof. Dr. Yaoming Ma



11-14 November 2025  
Online

The 9th International Electronic  
Conference on Water Sciences

## Organised by



## Co-Organised by



The Department of Rural  
and Surveying Engineering  
Aristotle University of Thessaloniki

## Organizing Team

[ecws@mdpi.com](mailto:ecws@mdpi.com)

# sciforum-130331: Efficiency Assessment of Wastewater and Sludge Treatment using Dielectric Constant and Loss Factor Measurements

Zoltán Jákói <sup>1</sup>, Balázs Lemmer <sup>2</sup>, Ákos Fazekas <sup>1</sup>, Sándor Beszédes <sup>1,\*</sup>

<sup>1</sup> Department of Biosystems Engineering, Faculty of Engineering, University of Szeged

<sup>2</sup> Department of Food Engineering, Faculty of Engineering, University of Szeged

---

In wastewater and sludge treatment processes, it is important to develop rapid and green measurement methods (i.e., with minimal chemical usage) that can be applied under industrial conditions, in addition to detailed analytical methods. Such methods could, for example, be used in the future for real-time efficiency monitoring. These requirements—non-destructive measurement, no chemical reagents required, and rapid determination—may be fulfilled by dielectric measurements. However, practical applications in the field of wastewater and sludge treatment remain limited.

In our research, an open-ended coaxial dielectric sensor (DAK3.5, SPEAG, connected to a Rohde & Schwarz ZVL3 VNA) was used to investigate the dielectric constant and loss factor within the 200–2400 MHz frequency range during various wastewater purification and sludge pre-treatment processes. Quantitative changes in organic pollutants in the wastewater were monitored by determining COD and BOD. During sludge treatments, changes in the solubility of organic matter (COD fractionation method) as well as aerobic and anaerobic biodegradability indicators (BOD and mesophilic biogas production) were also assessed.

The research results indicated that the decrease in organic matter concentration has a strong correlation with dielectric parameters in the 200–800 MHz frequency range. Moreover, it was found that, by jointly analyzing the frequency- and temperature-dependent dielectric behavior of wastewater of different origin and composition, characteristic differences in dielectric parameters could be observed—even for the same organic matter content. During sludge biodegradation, the critical frequencies corresponding to the maximum values of the dielectric constant and loss factor (within the 200–2400 MHz range) shifted towards higher frequencies, in accordance with the change in the organic matter removal efficiency and biogas production.

Acknowledgement: This research was financed by the National Research, Development and Innovation Office (NKFI) FK 146344 project.



© 2025 by the author(s). Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).