

CHARACTERIZATION OF WASTEWATER AND SLUDGE BASED ON DIELECTRIC PARAMETERS AND MONITORING OF ORGANIC MATTER REMOVAL

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Dielectric measurements are considered as rapid and non-destructive method and do not require special sample preparation and specific reagents. If the material under test or its components react differently to the electromagnetic field, differences in composition or certain biological, chemical or physical changes can be detected and monitored by dielectric measurements.

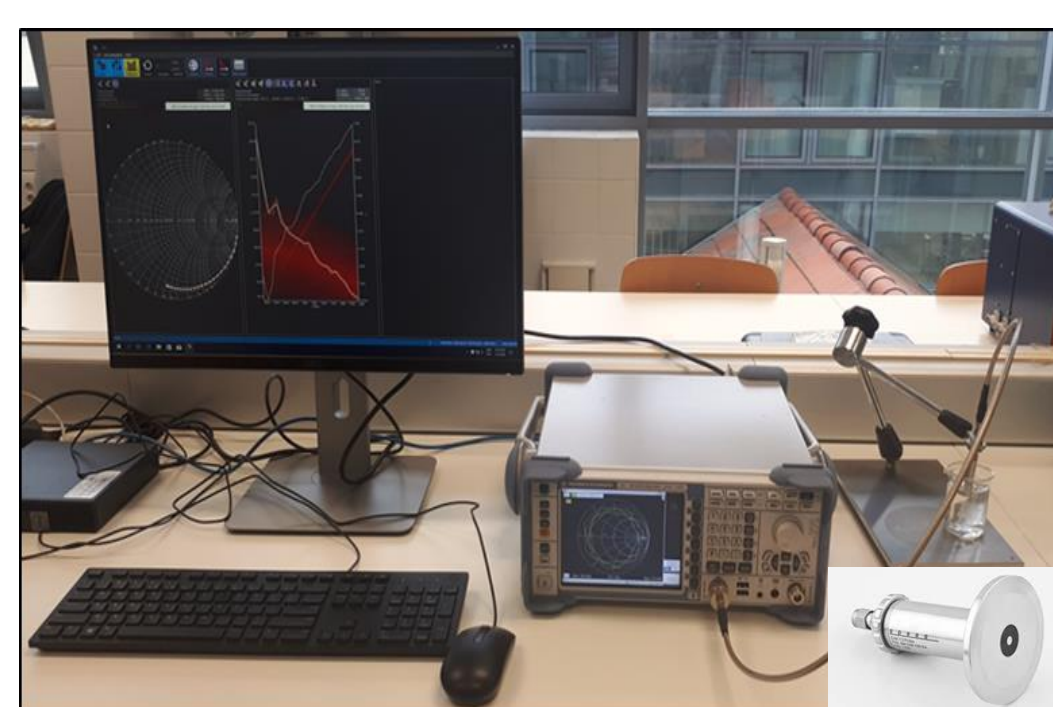
In our research work, the dielectric constant and loss factor of different types and origins, and from different stages of wastewater treatment processes, were investigated using an open-ended coaxial dielectric sensor (DAK 3.5, Speag) in the frequency range of 200-2400 MHz (ZVL-3 VNA, Rohde&Schwarz). Changes in conventional analytical parameters (COD, TOC, BOD) were also determined using anaerobic digestion (AD) and physico-chemical wastewater/sludge treatment processes.

It was found that difference between the sewage and sludge types can be detected by dielectric measurements. Furthermore, our results are also verified that the change of organic pollutant concentrations and the degree of sludge disintegration and biodegradation correlated well with dielectric parameters in the 400-700 MHz frequency range.

Methods



Continuously flow dielectrometer



SPEAG dielectric measurement system



Torch TOC/TN analyzer



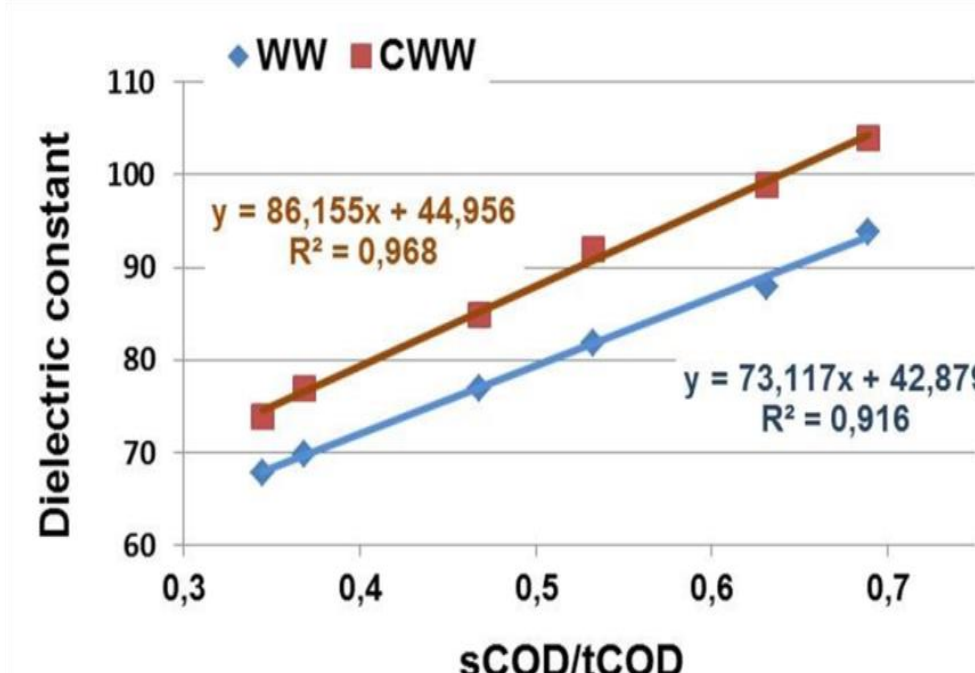
WTW Oxitop BOD/biogas measurement system



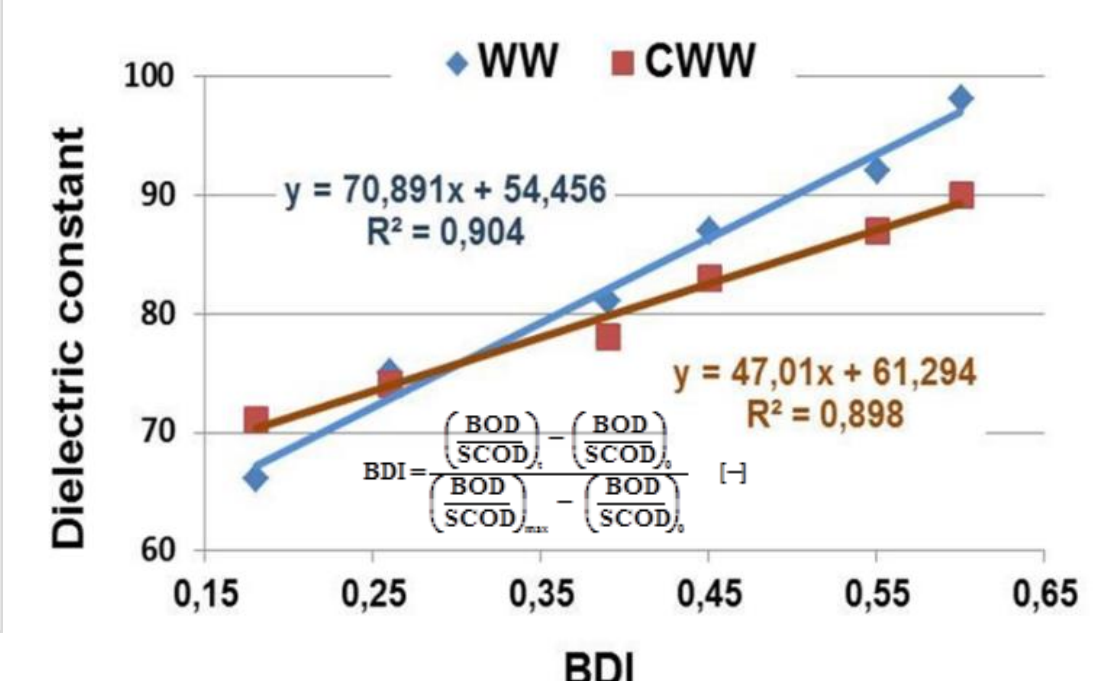
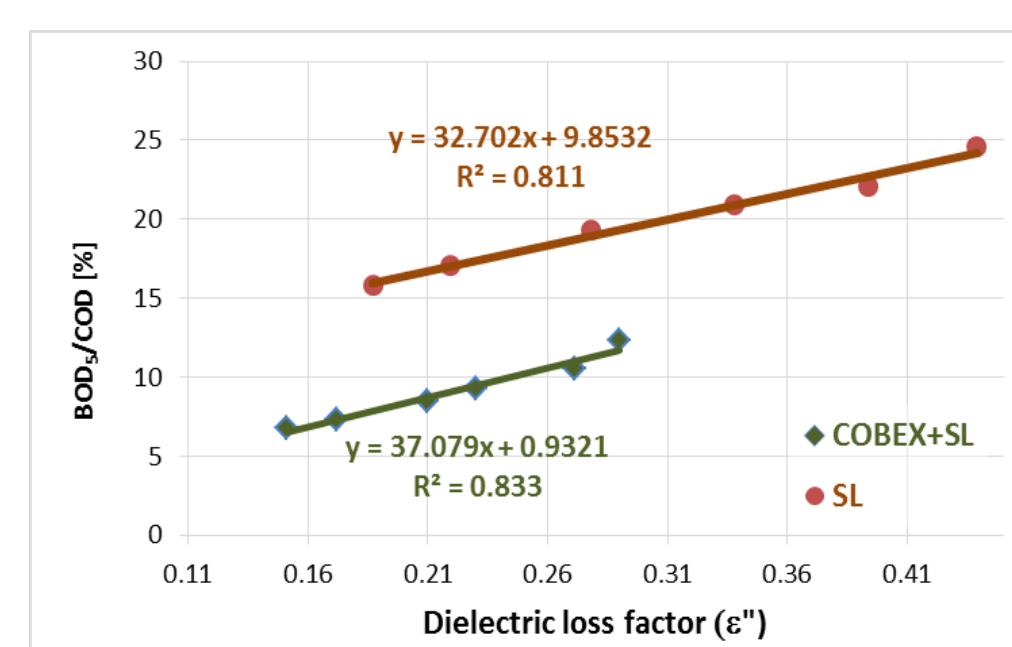
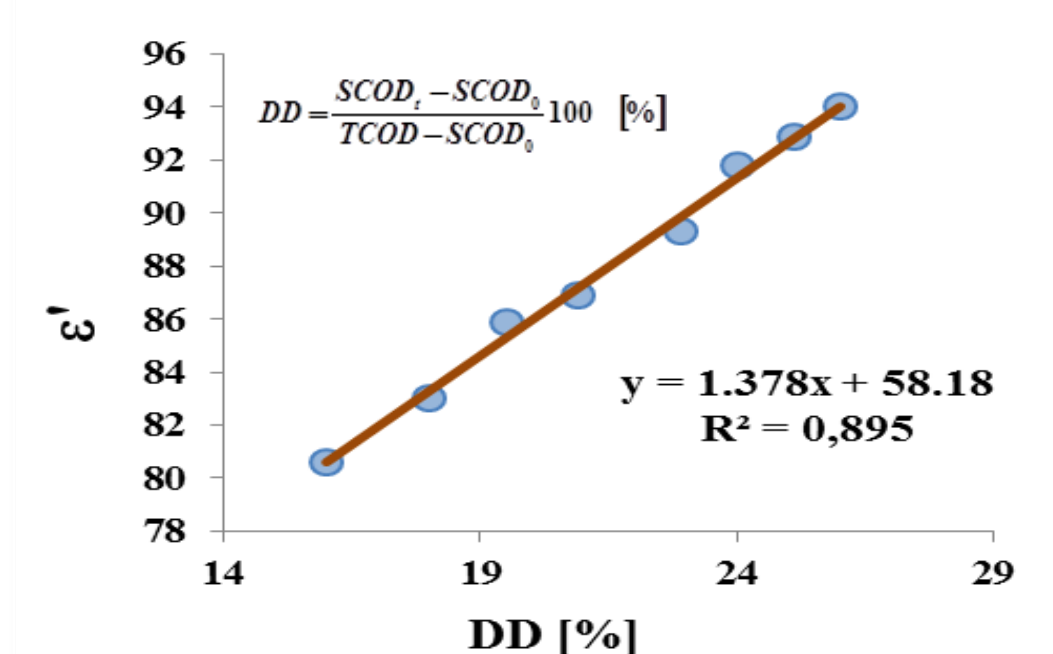
COD photometer



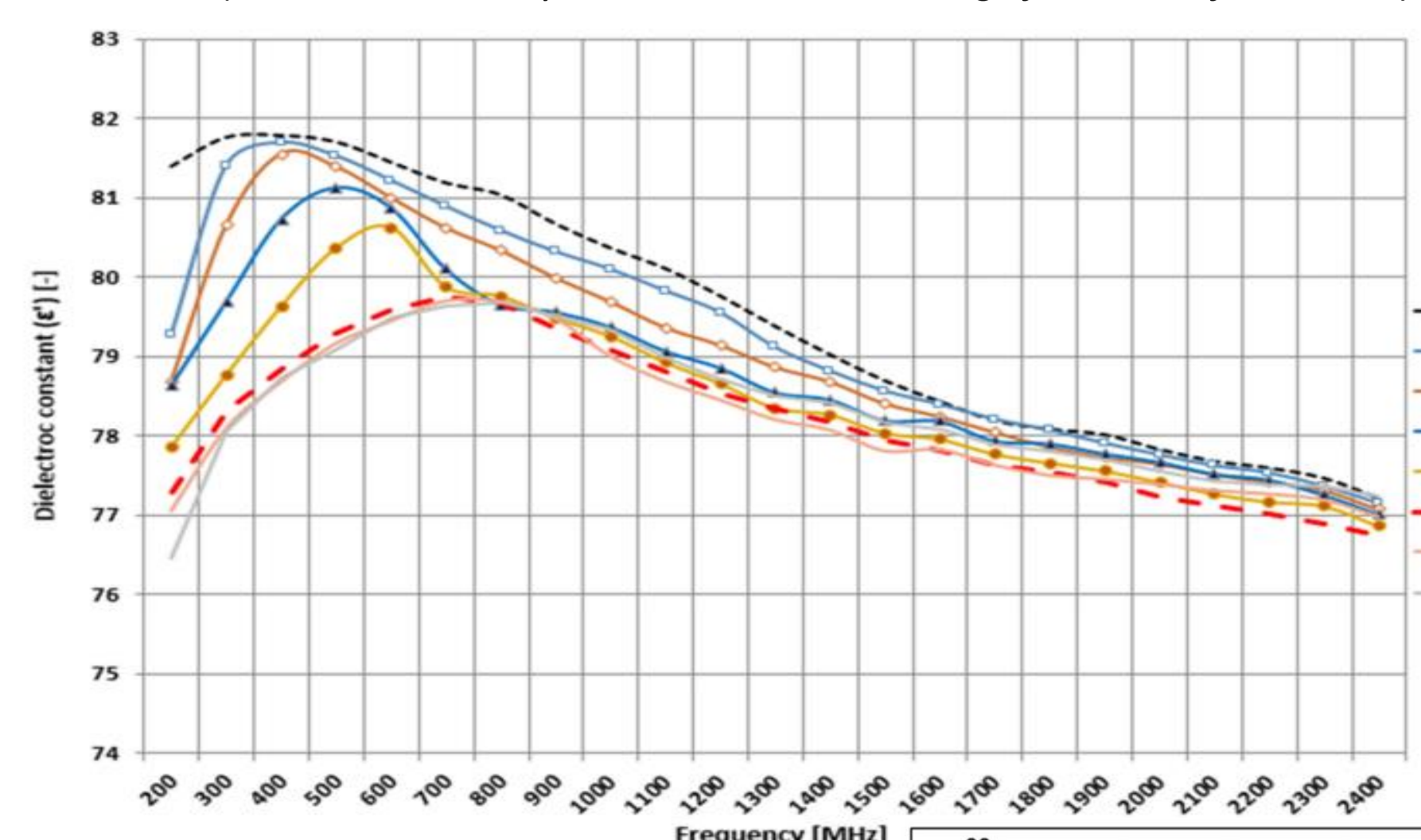
Results



Correlation of dielectric constant (ϵ' ; $f=600$ MHz) with organic matter solubility and disintegration degree (DD)
(WW-meat industry wastewater; CWW-sludge from WW)



Change of dielectric loss factor (ϵ'') and dielectric constant with BOD/COD and biodegradation index
(WW-meat industry wastewater; CWW-sludge from WW; $f=600$ MHz)



Dielectric constant of fermentation broth during AD (D2-18: days of AD) and correlation of ϵ' ($f=600$ MHz) with biogas yield

