# Characterization of industrial wastewaters by means of excitation-emission matrix (EEM) fluorescence

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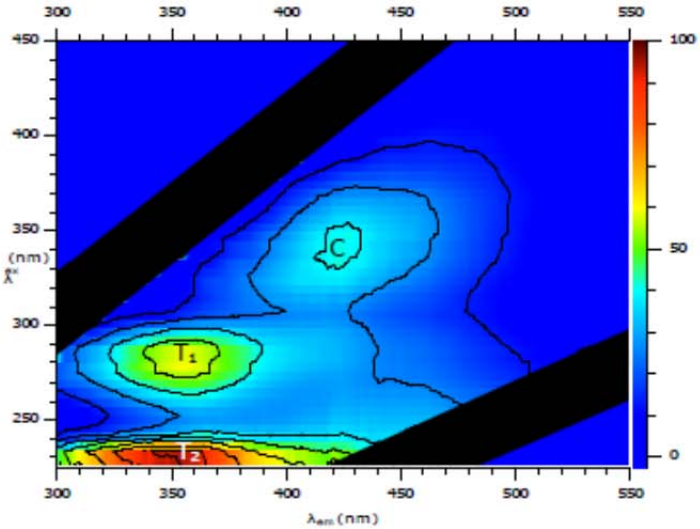
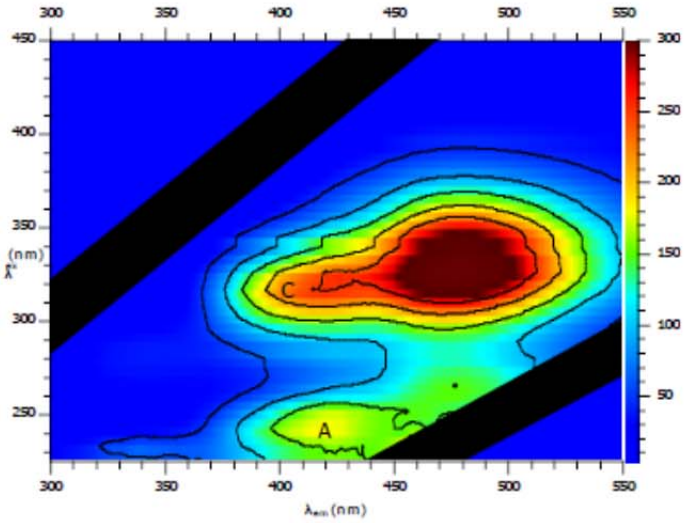
This study is aimed at characterizing the organic matter from several industrial wastewaters (influents/effluents from different types of industries: biscuit, dairy, slaughterhouse, pulp mill, textile dyeing and landfill leachates) in addition to urban/municipal wastewaters. The main objective is to search for specific fluorescence fingerprints by means of excitation-emission matrix (EEM) fluorescence, trying to identify each industrial sample by means of their characteristic spectra, if possible. The main organic compounds studied by fluorescence are proteins (tyrosine-like peaks B1 y B2 and tryptophan-like peaks T1 y T2) and humic substances (peaks A, C and M).

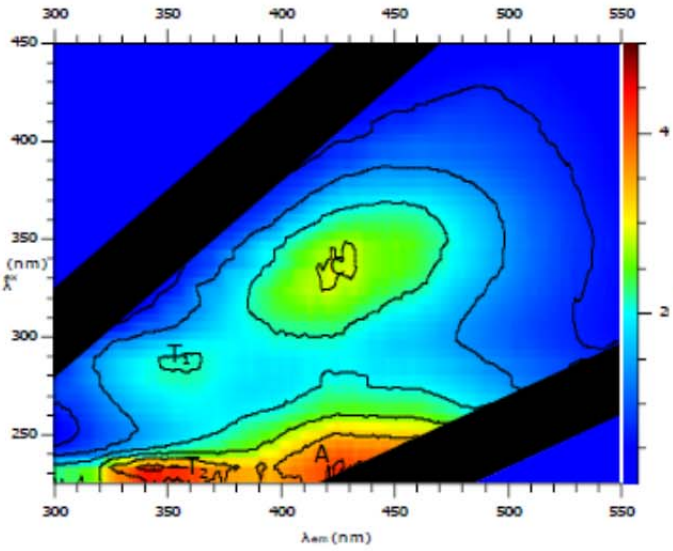
Based on our results, the EEM fluorescence has been found to be useful for the analysis of different industrial wastewaters, establishing common features for the biscuit and dairy industries such as the majority presence of peaks corresponding to protein materials (mostly peak T2). It has been seen that in the slaughterhouse effluent those peaks are also predominant but with the difference that peaks B, associated with the presence of low molecular weight protein material, are the most abundant in this case. In other industries such as a dyeing industry, it is observed the presence of an uncommon and intense peak at 330/480 nm, possibly derived from aromatic azo compounds present in the composition of certain dyes; in this case this particular spectrum could constitute a real fingerprint for this kind of industries. Concerning the pulp mill industry, it shows a very intense T2 peak, which in this particular case may be attributed to lignocellulosic materials.



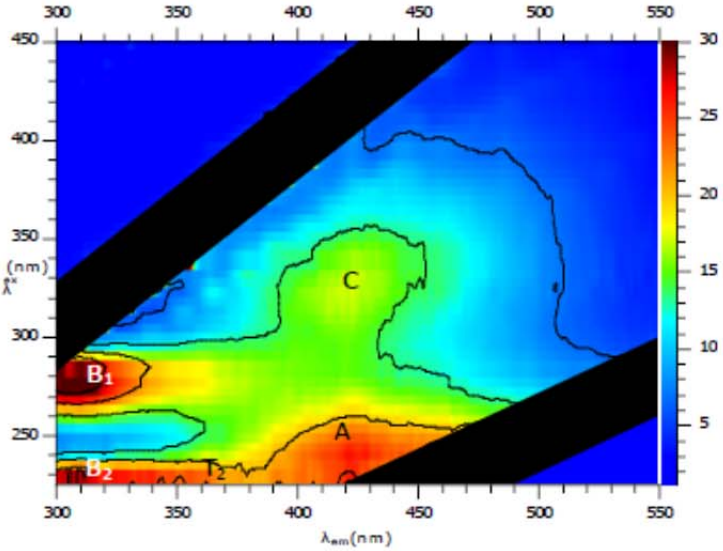

EEM spectrum from a dairy industry effluent




EEM spectrum from a dyeing industry effluent




EEM spectrum from a biscuit industry effluent

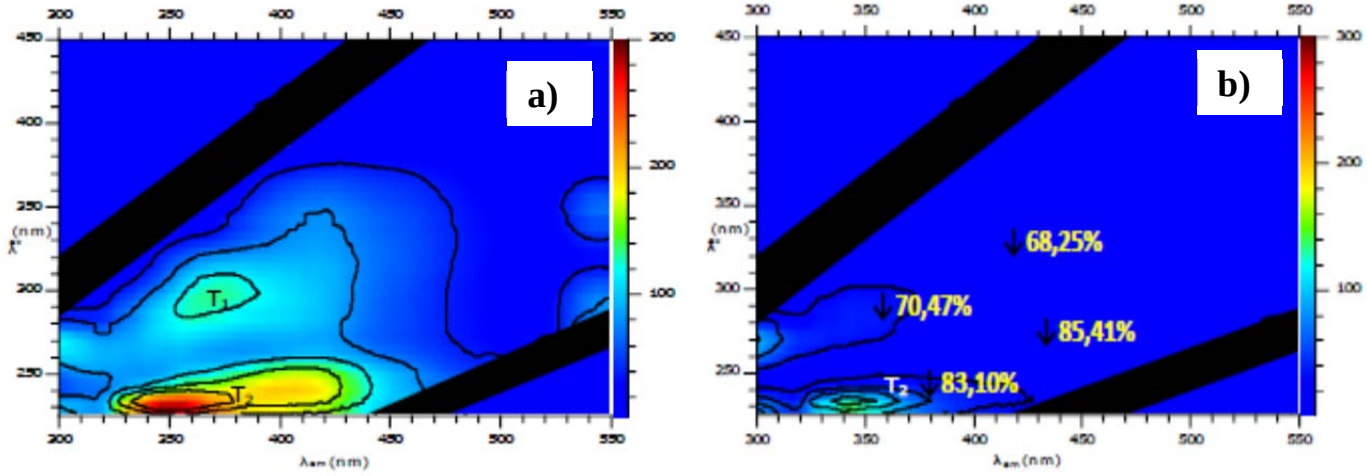



EEM spectrum from a slaughterhouse effluent

With the use of fluorescence indices, wastewaters have been characterized on the basis of their aromaticity (fluorescence index), degree of aromatic condensation of the organic matter present (humification index) and presence of organic matter of recent biological origin (biological index).

EEM fluorescence is also useful for studying the performance of the different stages in a wastewater treatment plant (WWTP), showing the characteristic removals at each stage. The plant studied in this work has been the WWTP from the city of Burgos, Spain.

Ozonation is becoming a more and more frequent option to treat industrial wastewaters. EEM fluorescence has also been found to be useful to monitor the changes suffered by the organic matter of wastewaters during the ozonation process, allowing the evaluation of the performance of this treatment.




EEM spectra from a pulp mill industry effluent: a) unozonated b) ozonated at 15 mg $O_3$/mg TOC