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Technological speciation of organics in water using UV-Vis spectrometry

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s::can Messtechnik GmbH is the world technology leader for submersible UV-Vis spectrometer probes.

As opposed to any laboratory methods, on-line spectrometry firstly extends our horizon to dynamic information about water quality. Beyond several other advantages, it is to be considered the only real-world method today to reliably detect, quantify and even fractionate organics in a lot of water types and applications.

We suggest to distinguish analytical from technological fractionation.

Analytical fractions derive from comparing spectral data with established analytical fractionation methods, by consideration of coloration, carbon double bounds / aromaticity, and so on. Examples are the distinguishing between total and dissolved organic carbon; biodegradable fraction; humics, fulvics, proteins, BTX, and many more.

Technological fractions are the ones that are interesting for the operator with respect to the behavior of organics in the observed system, from raw water over treatment and distribution to the tap, then waste water and finally receiving water. These fractions should be monitored to optimize the water system, treatment process, etc. Examples of such organic fractions are disinfection by-product precursors and /or formation potential; selective precursor removal at coagulation/flocculation; optimization of GAC filtration, ozonation, membrane fouling prediction and many more.

UV-Vis spectrometry is a highly redundant technique to 3D fluorescence as the chemo-physical principles of both methods are the same; 3D fluorescence having the advantage of information nicely visible to the human eye same time UV-Vis the disadvantage of more hidden information that needs to be recovered by more sophisticated chemometric methods; but at the same much broader and more information, and a much more stable, controllable, and field-going technology.

Delta-spectrometry: Up to date, s::can has been actively participating in different projects monitoring raw water matrices at different points of the river and along its passage from the river via bank into ground water. Different UV-Vis spectra upstream / downstream, or along the passage, are referenced to each other (“delta-spectra”) , and with this, changes being made cleanly visible. Also derivative spectra are being monitored to better make visible the removal or changes or organics composition. In the same way, organic fractions and their fluctuations are estimated when monitoring drinking water in distribution networks, e.g. during water stagnation, and also changes along treatment steps.

If this abstract accepted for oral presentation, the existing data would be structured and presented to foster discussion on the topic and to identify new challenges for UV-Vis spectrometry and its applications.