Assistant Prof. Gregor Marolt
Faculty of Chemistry and Chemical Technology, University Ljubljana

Detecting nanopollutants in surface water

"We see great potential in using OF2i® to support us with verification and development of our sensing technology. BRAVE Analytics is an outstanding innovation partner in solving one of the most pressing challenges of modern society – enabling better monitoring of ground and drinking water quality."

High-throughput detection of nanopollutants

Gregor Marolt (assistant professor at the University of Ljubljana) was looking to detect and measure the particle size of low concentrations of nanoparticles in surface water.

Challenge

The wear on tires results in over 1000 tons of nanoplastics landing in soils, rivers and seas each year. To enable low-budget detection of car tire nanopollutants in surface water, Assistant Professor Gregor Marolt and his research group at University of Ljubljana are developing an innovative screen-printed sensor technology. He needed a quick and reliable way to verify his measurements.

Application highlights

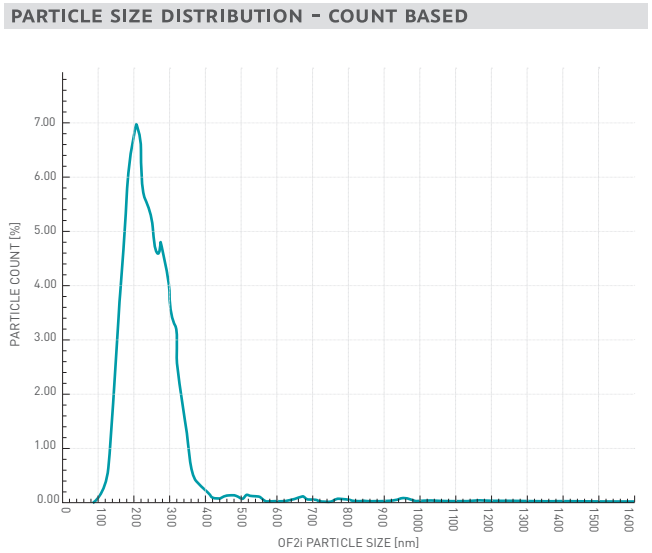
- Quantifying the differences between differently filtrated samples and measure D-Values, concentration and particle size
- High-throughput measurement with results ready after 5 minutes
- Detecting nanoplastics in real-time at ultra-low concentrations (down to a few particles per mL)

Experiment

The goal was to quantify the differences between differently filtrated samples. Comparing the number-based distributions and corresponding parameters (D90 and D3/4) for these two samples show, as expected, that for the suspension filtered with 0.45 µm more of the bigger particle fractions are present in the sample.
During the measurement over 300 particles were measured with single-particle sensitivity, also capturing unknown bigger particles (probably agglomerates).

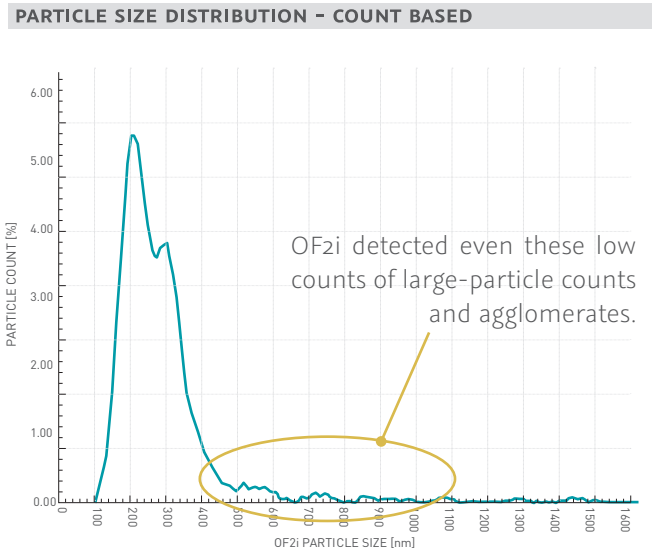
In the future, the system will be used for online real-time monitoring during development of the sensing technology. The inlet and outlet of the sensor will be connected to a small volume of analyte and concentration / PSD will be monitored dynamically as the particles are expected to collect on the electrode.
With the information it will be possible to correlate real-time data obtained with OF2i with the change of signal measured by the sensing technology of the group.

Sample filtered with 0.22 µm filter



Mean concentration ~8E5 objects
D90 - 321.2nm (90% of the population is smaller than 321 nm)

Sample filtered with 0.45 µm filter



Mean concentration ~E6 objects
D90 - 406.7 nm (90% of the population is smaller than 406.7 nm)

Comparison of number-based distributions for two samples (left: suspension filtered with 0.22 µm filter; right: suspension filtered with 0.45 µm filter)