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Continuous monitoring of aggregation of biomacromolecules

"Using BRAVE technologies in combination with other cutting-edge biophysical techniques has opened up exciting new possibilities to monitor the aggregation behavior of biological nanoassemblies."

Investigating the purity and aggregation of low-density lipoprotein (LDL) using OF2i® with additional Raman analysis

Building on the use case "Investigating the aggregation of biomacromolecules (OF2i®)", in further experiments with researchers at the Medical University of Graz we used the combined OF2i®-Raman setup to detect and characterize the 22-nanometer LDL particles and also their larger aggregates.

Challenge

The ability to scan a large volume of liquid and to continuously identify substances within is useful in many applications. Based on their Raman profiles we identified particles in the 20-nanometer range as LDL and also detected aggregates, which were similarly identified as LDL.

Application highlights

The OF2i® device with an additional Raman analysis module (BRAVE B-Elementary) was used to record the background Raman spectrum of the LDL samples. When the Raman spectrum of the buffer solution is known we can remove this from the analysis and the remaining spectrum is from the LDL particles. The larger aggregated particles were also detected and identified as LDL via their Raman spectra. It was possible to trap and hold these large particles in the sample flow to identify them.

Outlook

With the additional Raman analysis we are able to:

- Scan the composition of a liquid and read out the Raman spectra it contains
- Identify the presence of 22-nm LDL particles via the background Raman spectrum
- Detect large particles and identify them as LDL aggregates via their Raman spectra
- Confirm that the sample was composed of 22-nm LDL particles, aggregated LDL and the buffer solution

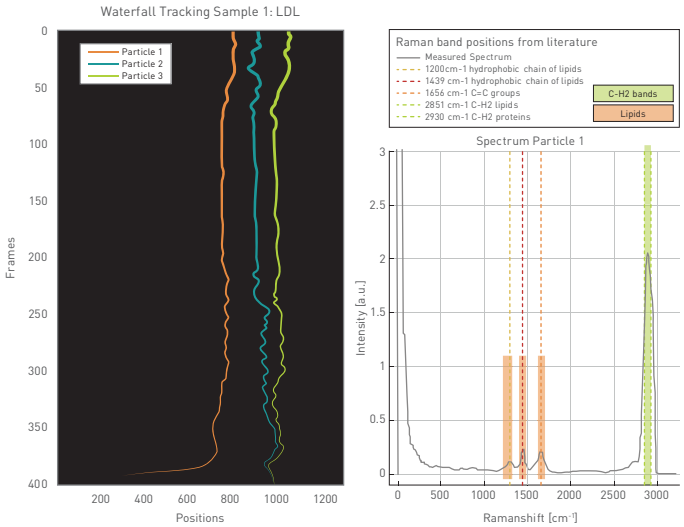

Figure 1: (left) LDL sample showing 3 large aggregates; (right) Raman spectrum of Particle 1 showing a typical LDL Raman profile.

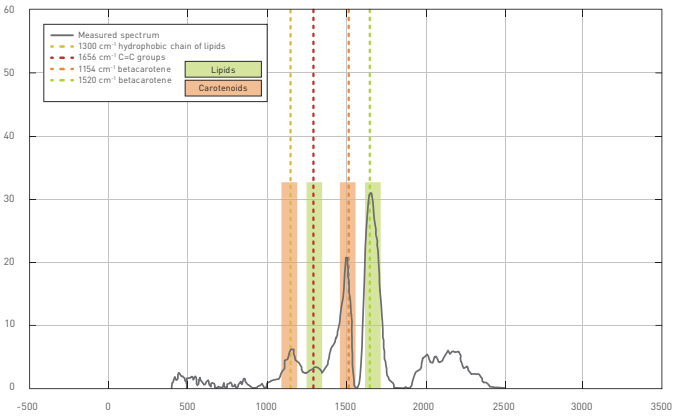

Figure 2: Analysis of the background spectrum of the ~20 nm-sized particles (buffer spectrum removed) showing the bands which indicate that the particles are LDL