

1. Two-dimensional assessment of accumulation and distribution of biomolecules

FTIR Nicolet™ iN10 MX Thermo Scientific™ microscope (Acquired in 2018)



Nicolet™ iN10 MX microscope is designed for imaging in mid-IR range. It is equipped with ceramic IR source and three detectors: DTGS, MCT-A and an array of 16 MCT-A detectors. The equipment allows registration of absorption spectra in the wavenumber range of 600-4000 cm^{-1} . Chemical mapping can be performed with the spatial resolution of 25x25 μm^2 , or using special conditions even 6.25x6.25 μm^2 .

The most common use of the setup is two-dimensional imaging of the distribution of biomolecules (proteins, lipids, compounds containing phosphate and carbonyl groups, creatine) and their structural changes (changes in the secondary structure of proteins, the level of saturation and unsaturation of fats, the length of lipid chains) in tissues. The microscope is equipped with an ultra-fast mapping system. Relatively short measurement time allows for the analysis of large areas and sets of samples, which improves case statistics crucial for reliable biomedical research.

2. Identification of chemical compounds and visualisation of their distributions in two and three dimensions

Confocal Raman microscope alpha300 R WITec (Acquired in 2020)



The alpha300 R confocal Raman microscope is equipped with a laser source with a wavelength of 532 nm and a maximum power of 30 mW. Microscope optic system consists of four objectives with magnification of 100x, 50x, 10x and 63x. The last, immersion objective, allows to perform measurements in liquids what improves S/N ratio due to the possibility of higher laser power use. The system includes a CCD detector and supports the recording of Raman spectra for the wavenumber range 90-4000 cm^{-1} with a spatial resolution below 1 μm^2 .

Representative applications of the system include two- and three-dimensional imaging of the distribution of biomolecules and their structural changes in single cells and tissue fragments, identification of microplastics, analysis of air dusts and other environmental samples.

3. Measurement of particle size, concentration and zeta potential

Multi-angle Dynamic Light Scattering (MADLS) Malvern Zetasizer Ultra Red equipped with titrator (Acquired in 2022)



The Malvern Zetasizer Ultra Red system is provided with a He-Ne 632.8 nm laser with a constant power of 10 mW and an avalanche photodiode. The system allows to measure the size and zeta potential of particles, alongside their concentration. Using the MADLS system, the hydrodynamic diameter and concentration of particles can be determined in the range from 0.3 nm to 15 μm and 10^8 to 10^{12} particles per mL, respectively.

Standard applications of the system include the analysis of the above-mentioned parameters for nanoparticles, nanoplastics and other nanomaterials suspended in solutions. Equipment of the system with a titrator, allows to conduct measurements as a function of the variable pH of the solutions.