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Abstract

The PAMONO-Sensor Enables Quantification of Individual Microvesicles and Estimation of Nanoparticle Size Distribution †

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In our recent work, the plasmon assisted microscopy of nano-objects (PAMONO) was successfully employed for the detection and quantification of individual viruses and virus-like particles in aquatic samples (Shpacovitch et al., 2015). Further, we adapted the PAMONO-sensor for the specific detection of individual microvesicles (MVs), which have gained growing interest as potential biomarkers of various physiological and pathological processes. Using MVs derived from human neuroblastoma cell line cells, we demonstrated the ability of the PAMONO-sensor to specifically detect individual MVs. Moreover, we proved the trait of the PAMONO-sensor to perform a swift comparison of relative MV concentrations in two or more samples without a prior sensor calibration. The detection software developed by the authors utilizes novel machine learning techniques for the processing of the sensor image data. Using this software, we demonstrated that nanoparticle size information is evident in the sensor signals and can be extracted from them. These experiments were performed with polystyrene nanoparticles of different sizes. We also suggested a theoretical model explaining the nature of observed signals. Taken together, our findings can serve as a basis for the development of diagnostic tools built on the principles of the PAMONO-sensor.

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