Impedance sensing of polystyrene microspheres in a microfluidic channel: An integrated electro-optic method

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Electrical impedance measurements through microfluidic channels have been extensively studied over the last years, because electrical impedance is a simple and essentially a non-invasive technique that allows characterization of nano- and microparticles or other inorganic nano- and microstructures in a dielectric medium. Electrical impedance sensing has successfully been used in flow cell cytometry, allowing the classification of different cell types. Here are presented results for polystyrene microspheres in a custom electrical impedance system composed of a modified commercial microfluidic channel along with optical micro-imaging characterization in an inverted microscope, quantifying the relationship between microspheres density, wavelength illumination range and magnitude of the electrical impedance signal for carboxyl and amino functionalized-microspheres in different fluid media. These observations are sustained by numerical modeling and discussed within a general theoretical framework. The obtained results might have potential application to classify novel nano- and micro-objects and further develop artificial intelligence-enabled drug delivery platforms.