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Dielectric Spectroscopy: noninvasive and fast method for measuring changes in the membrane potential CORINA BOT, CAMELIA PRODAN, New Jersey Institute of Technology, EMIL PRODAN, Yeshiva University, Stern College for Women — We present a noninvasive and fast method, dielectric spectroscopy, to measure changes in the membrane potential of live cell suspensions, in particular to E. coli. This technique can be applied virtually to any cell suspension, regardless of size or shape and is tested against the traditional one-using voltage sensitive dyes. Precise measurements of the dielectric permittivity ε and conductivity σ of live cells suspensions require prior elimination of the polarization errors. Polarization errors are caused by the ionic content of a buffer, and they affect the total impedance in the low frequency interval. We hereby present our approach of polarization removal in low frequency limit by fitting both real and imaginary experimental curves with an ideal impedance Z=d/i$\omega\varepsilon^*$S, where $\varepsilon^* = \varepsilon+1/\mathrm{i}\omega\sigma$. Here, ε and σ represent the fitting parameters; a higher weight is given to each of them for the high frequency domain (3kHz-10kHz), where polarization effects were proven negligible. Measurements were performed in a low electric field (1V/cm) and 40Hz-10kHz frequency domain. Different buffers are measured, such as HEPES, DMEM with different KCl concentrations. Adding different KCl concentration or ionophores triggers changes in the membrane potential of E. coli. Those changes are measured using dielectric spectroscopy and voltage sensitive dyes.

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