Pulseometry: A Differential Readout to Compensate Signal Drift of Potentiometric Probes

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Ion selective electrodes are widely used sensors in POCT devices to assay electrolytes in whole blood samples. With single-use systems the first solution contact normally results in an important signal drift that negatively affects measurement accuracy. In this work, a novel approach coined pulseometry is proposed to compensate for signal drift. The potentiometric signal is processed through a differential circuit incorporating RC components of different time constants. The differential potential will remain constant for a slowly drifting baseline while a rapid potential change will result in a peak-shaped difference signal that may be baseline subtracted and integrated to extract the components information. The method was successfully integrated into mass fabricated, microfluidic test cards used in commercial blood gas electrolyte analyzers. Blood calcium levels from three individuals were measured, giving standard deviations of 0.008-0.024 mM, improving precision by 36-67 % compared to potentiometry. These results showcase the potential of pulseometry for improving the performance of electrochemical sensing in clinical diagnostics.