Miniaturized Electrochemical Sensing Unit for Cell Cultures

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Abstract
The need to gather data at a high rate in biomaterial science or medical field has become an essential element and this is facilitated once microfluidic chambers are employed. Multiparametric biosensing platform embedded microfluidic chambers require the miniaturization of several electrodes on a small volume. The measurement strategy should limit interfering and cross-talk signals. The obtained electrochemical data that include low-level voltages and/or currents is one of the important sources of data in evaluating the condition of the cell cultures. Monitoring of these signals requires large and expensive data acquisition modules. Nowadays, a significant number of experiments make use of these signals to monitor the changes in the structure, composition, metabolism and the health state of biological samples. The medical practitioners need to monitor the behavior of these signals in time as generally the biological signals have some transient components. For this reason, the data should be stored in a computing unit by means of data acquisition cards. In this work, we present the design of portable potentiometric and chronoamperometric circuits on PCB that utilize myDaq and NI Labview for the measurement of the potential difference and current values as a function of time. The components used are all portable units, cost-effective, the data acquired and analyzed, and an excellent match is observed with the data acquired using benchtop commercial products.

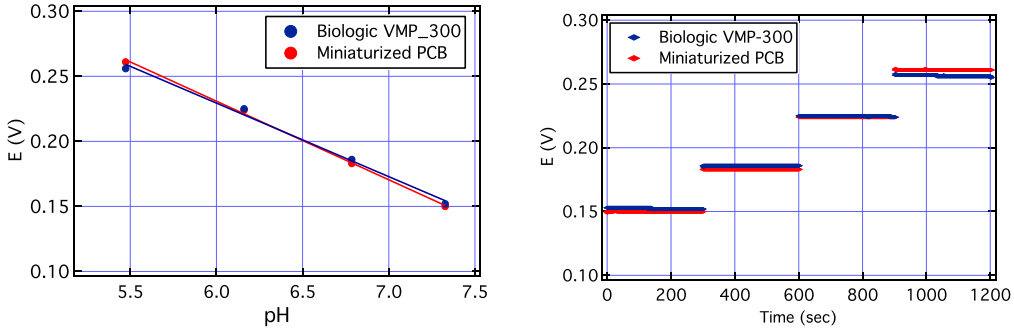

Figure 1. The results obtained from the commercial unit and the homemade miniaturized PCB

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