ABSTRACT

Electrochemical Impedance Spectroscopy (EIS) measurement is a method of analyzing electrical properties used to measure corrosion, battery electrode quality, and analyze material properties, namely resistance and conductance. However, in a laboratory context, the current use of equipment is still inefficient and not well integrated, which can cause several problems in its performance. The main problem related to this research is integrating the Function Generator tool, Teensy 4.1 Potentiostat and processing data.

This research proposes the integration of three main systems in EIS measurements, namely function generators, potentiostats, and data processing systems. We present solutions specifically designed to overcome these challenges, including improvements to existing potentiostat designs, enabling more efficient and accurate EIS measurements. Additionally, we integrated the necessary hardware and software, including Teensy 4.1. as a microcontroller and data collector, to facilitate data collection and more efficient data processing. Thus, this research creates an integrated system that enables more sophisticated and effective EIS measurements.

The results of designing these 3 systems have proven successful in integrating the Function Generator (AD9833), Potentiostat and Teensy 4.1 into one box. For analysis results we use the Nyquist plot. Nyquist plot is one of the analytical tools used to analyze data produced by EIS experiments. In this research, we analyzed 4 different Randles cells connected to a potentiostat, this difference we replaced R series, R parallel and C (capacitor). Of the 4 Randlles cells, the smallest error was found, namely Randles cell 3 with Rseri 47 Ω, Rpararel 100 Ω and C 1uf, which tested various errors the smallest of the other four randle cells. The Zreal error value is 10.04% and the Zimajiner error value is 64.11%.

Keywords: EIS, Function Generator (AD9833), Potentiostat, Teensy