ABSTRACT

Electrochemical Impedance Spectroscopy (EIS) is a technique for studying electrochemical reactions by analyzing signals at electrodes, yielding impedance data. In this study, an EIS setup utilized an AD9833 DDS Function Generator module to generate sinusoidal signals, sent to a potentiostat for conditioning electrochemical responses. A Raspberry Pi 4 Model B controlled the GDS-1102A-U oscilloscope for data acquisition and the AD9833 DDS module. Complex numbers for each signal were obtained via Fast Fourier Transform (FFT), and impedance was calculated using Ohm's law by dividing voltage perturbation signals by current response signals in complex number format. Results were presented in a Nyquist Plot, revealing a strong relationship between input and output frequencies, with correlation coefficients of 99.99894% and a determinancy coefficient of 99.97880112%. The initial 1.690281212% measurement error decreased to 1.43350009107172%. A robust relationship was also found between impedance values and real components, with correlation coefficients of 92.43833129% and a determinancy coefficient of 85.44845092%. The initial 243.9793474% error decreased significantly to 8.837180343%. Concerning imaginary components, a correlation of 71.72450153% with a determinancy coefficient of 51.4440412% was observed. Post linear regression, the measurement error reduced from 227.5960622% to 35.96855878%.

Keyword : *Electrochemical Impedance Spectroscopy, Voltage, Frequency, Randles Circuit*