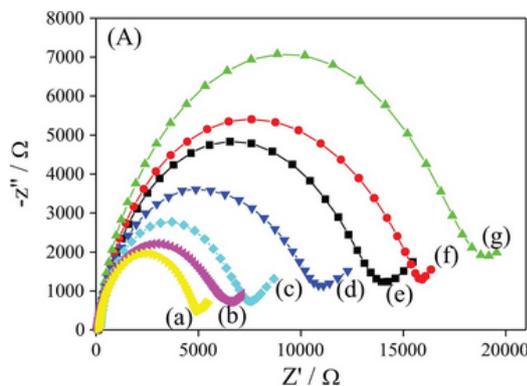


Electrical Impedance Spectroscopy and its applications

Review and low-cost implementations



Background

Electrical Impedance Spectroscopy (EIS) is used to extract an electrical fingerprint of a biological/chemical sample. A sinusoidal test signal, with varying frequency is injected into the sample and the sample's impedance as a function of frequency is registered and fitted to some equivalent electrical model. This provides important insights into the sample's properties and has a wide range of application. EIS is used to diagnose batteries (State-of-Health and State-of-Charge) [1], monitor corrosion [2] and used in medicine as a non-invasive imaging technique [3]. It has been used for bacterial diagnosis in food [4] and can be used to detect inflammation of the mammary glands in cows [5]. One of the major obstacles when implementing EIS is the cost of the analysis instrument which performs the precision measurement of the impedance spectrum [6] and inexpensive, application-specific solutions based on readily available consumer electronics is extensively researched.

Project description

In this project you first do a thorough review of the EIS technique (theory, implementations and applications), suggest a low-cost implementation (in programmable electronics) and perform some preliminary calibration studies on that design (and compare its performance to that of a commercial instrument).

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