

# Master thesis: Freiburg's Embedded Potentiostat (FreiStat)

Electrochemical sensors and biosensors are the most diverse sensor family but at the same time least integrated into Internet-of-Things (IoT) scenarios. Numerous domains would benefit from sensor nodes in a cloud ranging from environmental monitoring at remote places, systems for in situ corrosion analysis, chemical sensors part of electrochemical energy systems, and the biomedical field.

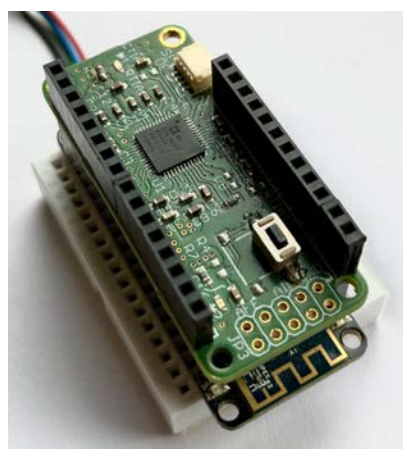
Within two Master previous theses, the FreiStat hardware and an open-source software framework consisting of microcontroller firmware, a Python library, and a GUI was developed and successfully tested in electrochemical experiments.<sup>1</sup>

## The goal of the thesis

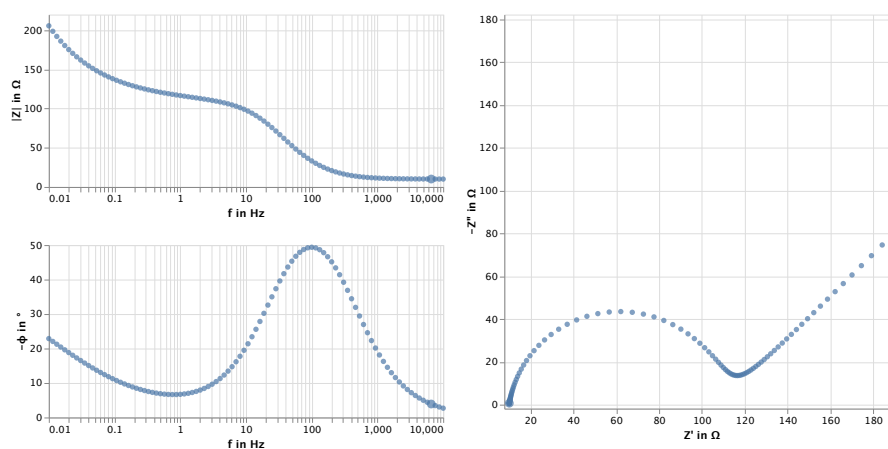
- Implementing the software framework for electrochemical impedance spectroscopy (EIS)
- Applying the developed methods for measurements with sensors and in corrosion analysis

## Requirements

- Profound experience in microcontroller programming (C++, Adafruit)
- Knowledge of Python, optionally GUI programming
- Motivation to understand and extend a sizeable existing software framework
- Optional: knowledge of electrochemical methods, especially EIS



FreiStat stacked on an Adafruit Feather M0 WiFi



Electrochemical impedance spectroscopy: Bode plot (left) and Nyquist plot (right)

Have we sparked your interest? Please check the project's Github webpage and apply to the contact given below.

## Contact

Dr. Jochen Kieninger (kieninger@imtek.uni-freiburg.de)

University of Freiburg, IMTEK – Department of Microsystems Engineering,  
Laboratory for Sensors // Laboratory for Electrical Instrumentation and Embedded Systems  
Georges-Köhler-Allee 103, 79110 Freiburg

<sup>1</sup> <https://github.com/IMTEK-FreiStat>