

Capacitive properties of a gold/electrolyte interface

Lab Course

Physik E19 (AG Krischer), Technische Universität München

Abstract

When metals are brought together with electrolytes, many interesting physical and chemical phenomena arise at the contact surface. The most well known application of these effects is probably the fuel cell, which converts chemical to electrical energy with a high efficiency. In this lab we will explore another remarkable property of metal/electrolyte interfaces: Their ability to separate charges on a very small length scale. This allows for the construction of extremely powerful capacitors. The large capacitance those systems provide is used in many applications where huge amounts of energy must be stored and released quickly. A prominent example is regenerative braking in hybrid cars.

In this lab course, you will study the capacitive properties of a polycrystalline gold electrode in a solution of perchloric acid. You will get an introduction in the technique of impedance spectroscopy and learn about the principal setup of electrochemical experiments. You will measure the capacitance of the gold/electrolyte interface and compare its behaviour with the predictions of theoretical models. Then you will use the values you obtained to estimate the amount of charge carriers on the electrode.