Introduction to Applied Impedance Spectroscopy

Darmstadt, 29-30 October 2024

Dear participants of our upcoming EIS course,

We are looking forward to welcoming you at our site and wish you a pleasant journey to Darmstadt. We will lead you through two days of in-depth theoretical as well as practical training in impedance spectroscopy. Hopefully, there will be a fruitful interaction with interesting discussions between all of the participants as well.

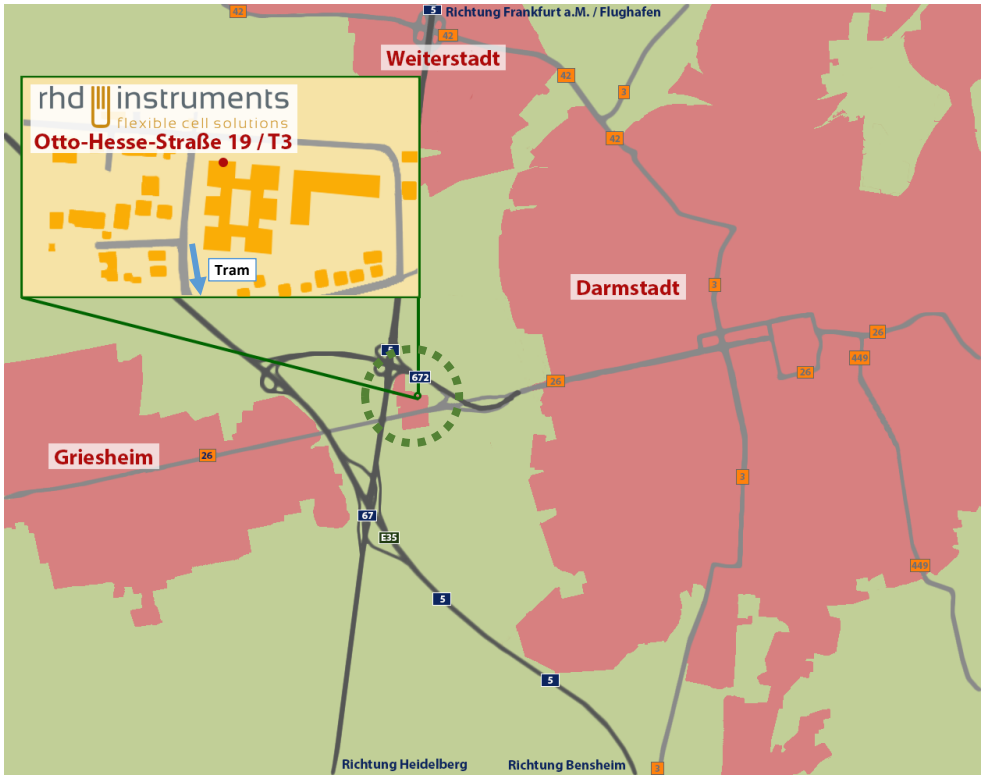
The training course language will be English. You will receive all presentations as PDF files for your personal use.

In the following, you will get further information about directions and the schedule of the course. Please do not hesitate to contact us via phone or email if you should have any further questions.

With kind regards,

Your rhd instruments team.

Venue and Arrival



Arrival by public transport

We recommend to get to rhd instruments via the tram system on line no. 4 or 9 which operates on a 10-minutes interval (N.B. do not take the express line no. 10). For those coming from Darmstadt/city, please take tram no. 4 or 9 in direction “Griesheim”. For those coming from Griesheim, please take tram no. 4 or 9 in direction “Kranichstein Bf.” (tram no. 4) or “Böllenfalltor” (tram no. 9). When arriving by train at Darmstadt Main Station, use the tram stop “TZ Rhein-Main” after leaving through the north-exit of the train station.

Exit at the station “Otto-Hesse-Straße”, cross the narrow street (cycle way) and follow the Otto-Hesse-Straße. After a short distance, you will notice a complex of buildings on the right side. Please continue walking along the Otto-Hesse-Straße parallel to these buildings until the end of the street (in front of small red-brick building). Now turn right. The building at the edge is building no. 19 / T3 where you will find rhd instruments on the first floor.

Up-to-date timetables for public transport can be found on the RMV website: www.rmv.de.

Arrival by car

We have limited parking capacity. Therefore, please contact us as soon as possible if you plan to arrive by car in order for us to reserve a parking space for you. For your navigation device, please use the following address: “rhd instruments GmbH & Co. KG, Otto-Hesse-Straße 19, 64293 Darmstadt”. For more detailed information, please contact us via phone.

Agenda

The **training course will begin on 29 October at 9 a.m.** After introductions, we will start with the theoretical session aimed at introducing the fundamental aspects of the measuring method impedance spectroscopy. The following topics will be discussed:

- Introduction into EIS – basic concepts and requirements
- Impedance behavior of standard circuit elements and equivalent circuit concept
- Electrochemical circuit elements: CPE, Warburg, TLM
- Data fitting – algorithms, weighting, errors
- 3-electrode impedance measurements – challenges and artefacts
- Introduction of the DRT concept

In-between, we will have a first hands-on lab session during which you will have the chance to measure impedance spectra of pre-made equivalent circuits or of circuits made by you.

The official part of the **first day will end at approx. 5 p.m.**

The second day will begin at 9 a.m. and will focus on important practical applications:

- Determination of the temperature-dependent conductivity of a liquid electrolyte
- Determination of the MacMullin number of an electrolyte-wetted separator foil
- Investigation of the impedance behavior of a Li-ion coin cell
- Study of the pressure-dependent impedance behavior of a solid-state electrolyte sample

For each topic, we will first provide you with an introduction before we will have hands-on experiments. For the experiments, we will form small groups so that every participant will have the chance to contribute to the experiments and to ask questions.

If there is time left, we will also give a brief introduction into the EIS data fitting and simulation software RelaxIS 3.

The **training course will end on 30 October at approx. 4 p.m.**

During the talks, experiments, and the breaks, we will have enough time to discuss your own specific applications and experimental challenges.

Lunch, dinner etc.

During the course, we will offer free coffee, tea, juice, fruit, and pastries. For lunch, we will visit a small bistro nearby called “Kreative Töpfe” (http://www.bistro-darmstadt.de).

Kreative Töpfe

On Tuesday evening, we invite you for dinner to one of the most famous restaurants in Darmstadt called “Braustüb’l” which is well known for its brewery. If you should arrive at Darmstadt on Monday morning, and should not have enough time to leave your luggage in the hotel, you can leave it at our site and pick it up later in the evening. A menu as well as further information can be found on the website of the restaurant: https://www.braustuebl.net/de/.

Braustüb'l
Brauerei-Ausschank

Important:

Please let us know if you should have any food intolerance or other requirements concerning the meals. We want you to feel comfortable and thus we try our best to consider your wishes and individual needs.

Certificates and RelaxIS 3 trial license

Every participant will receive an individual certificate with information about the content of the training sessions. Furthermore, all of the presentations will be provided as PDF files.

Finally, every participant will receive a free 60-days trial version of the impedance data analysis software RelaxIS 3. The trial period will begin after first starting the program. More details about the installation, handling, and most important features will be given during the course.

Contact data

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