Master Thesis

Li-ion Batteries for Electric Vehicles – Electrochemistry and Safety Investigations

Context The high energy density and the good cycle life of **Li-ion batteries** designed for **electric vehicles** are the result of a long industrial development process. However, not everything is fully understood and there are many aspects requiring a deeper fundamental investigation. The interplay between the **physical factors** such as temperature, mechanical load etc. and **electrochemical factors** such as state of charge, electrode potentials, the active materials used etc. are of critical importance. These factors are relevant to **safety** aspects as well as to **battery ageing**.

Candidate The Master candidate must have a **Bachelor Degree**(**BSc**) in **Chemistry**, **Physics** or **Chemical Engineering**. The candidate should possess good experimental skills and an availability for work in collaboration with industrial partners. Any previous experience with glove-box working protocols as well as electrochemistry is welcomed but it does not constitute a prerequisite – training in this field is covered. A **stipendium (Forschungsbeihilfe) of 440 € per month** is offered for the 6 months duration of this Master Thesis work.

Topics The candidate will investigate the **Li-ion cells** used in a commercial **electric vehicle** model – these cells are already available in our lab. This involves the design and introduction of a **reference electrode** followed by **cycling** of the cell with monitoring of both anode and cathode electrode potentials. Also, the candidate will test some cells that were subjected to mechanical loading (acceleration/ deceleration) in an attempt to find the weak points leading to **electrical short circuits** inside cells.

Location This work is part of the **SafeBattery** research project, a consortium of 3 research institutes of TU Graz (**VSI, ICTM, VIF**) and and 8 industrial partners (**Audi, AVL, Daimler, Bosch, Kreisel, Porsche, SFL, SM**). The work will mostly take place at Institute for Chemistry and Technology of Materials (ICTM) in the group of Prof. Martin Wilkening. Some work will also be done in collaboration with the Vehicle Safety Institute (VSI).

Duration 6 months, starting date: 1.03.2019.

Contact If interested, please send your CV per e-mail to Dr. Ilie Hanzu (hanzu@tugraz.at).