

Master Thesis / Vertieferpraktikum

The role of the Polymer binder architecture for the dry production of battery cathodes

In the production of battery cathodes a polymer binder is used to achieve the necessary cohesion and mechanical strength of the electrode. PVDF is one of the most commonly used polymers, especially for high voltage battery chemistries such as lithium-ion batteries, due to its high stability over the applied potential range. Therefore, PVDF grades from different manufacturers are well accepted by the industry for the state of the art production of electrodes.

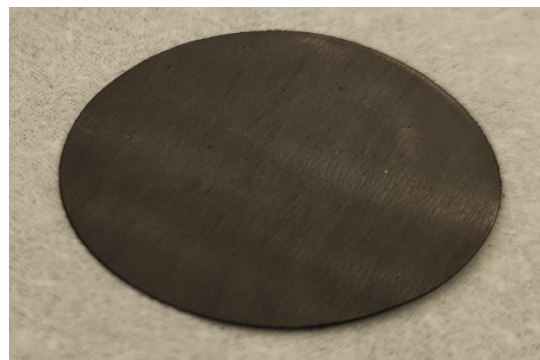
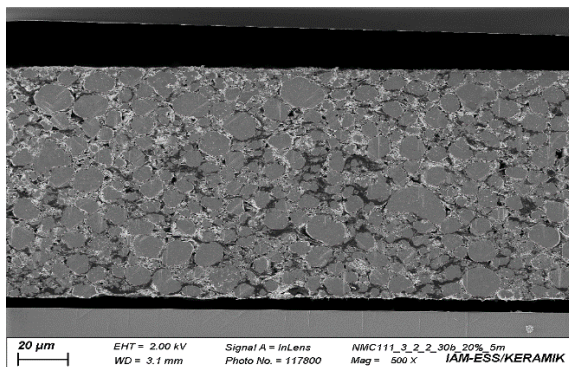
Since the dry production of electrodes differs very strongly from the state of the art electrode production, the polymer binder has to fulfill a new role. Additionally to the previous properties (cohesion and mechanical strength) now it has to act as a processing aid as well. The polymer properties, such as molecular weight, branching and chemical structure have different effects when used in the dry process compared to the state of the art electrode production. Therefore, these properties have to be reevaluated for their impact on the processability in the dry process, the electrode adhesion to the current collector and the mechanical strength of the electrode.

Challenges:

- How does the chemical structure of the polymer affect its affinity towards the active material?
- Does the molecular weight of the polymer change the processability of the electrode materials?

Practical tasks:

- Preparation of battery electrodes: from mixing over electrode production to battery cell assembling
- Measurement of electrode properties: porosity, mechanical strength, powder flow and electrochemical performance



Previous experience in polymer chemistry is beneficial but not necessary. The ability to independently work on the scientific questions and conduct experimental and analytical methods is necessary.

This work can be done as a master thesis or Vertieferpraktikum. The start of this work is planned to be in January to February. It can be done in English or German. Please take notice that it is done at **Campus North**.

If you are interested in this work, feel free to contact me, **Andreas Gyulai** (andreas.gyulai@kit.edu).

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