



Battery research @ National institute of chemistry

- Long term research program on batteries – 5 FTE
- In-line with a Battery 2030+ roadmap
- 1PI, 6 permanent researchers, 10 post-docs, 18 PhD students, 5 technician

Two large units

- Laboratory for Modern Battery Systems (Department of materials chemistry - Ljubljana)
 - Equipment for battery research at TRL 1-4



- **battery testing with currents up to 5A**

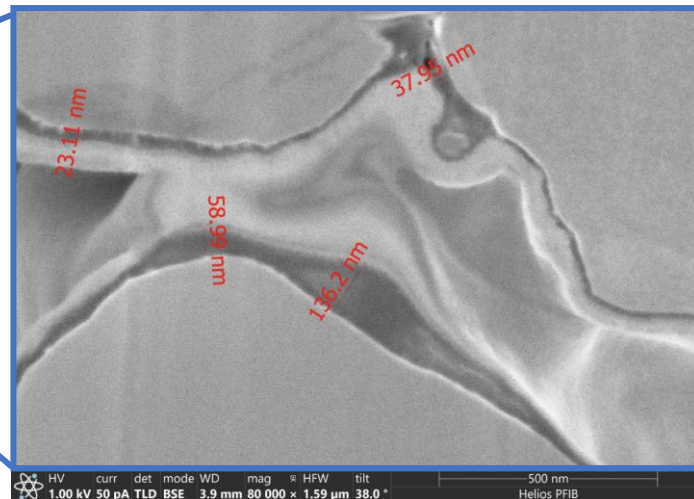
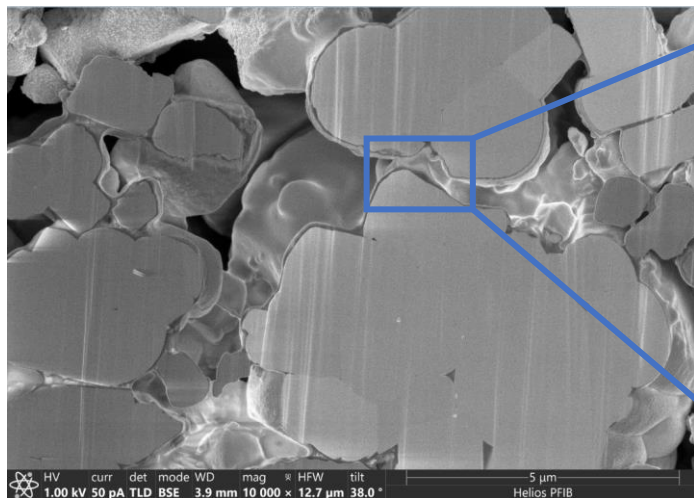
- Laboratory for battery development and testing (Center for Development, Demonstration and Training for Carbon-Free Technologies - Kisovec)
 - Equipment for prototypes and small production (TRL 4-6)



battery testing with currents up to 500A

Failure in reality _ PFIB-SEM

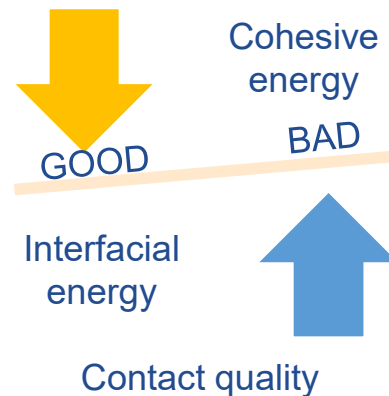
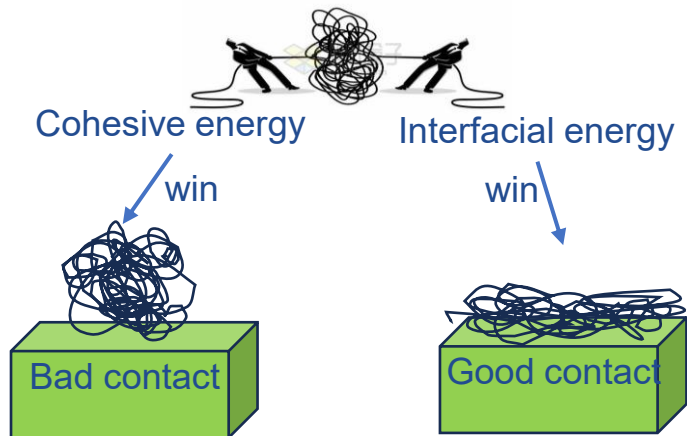
- ❑ Terrible contact problem at the NMC/SICP interface



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101069703.

- Tens even hundreds of nm gap exists between NMC particle and single ion conducting polymer (SICP), leading to the terrible contact and thus terrible ionic conducting issues

- ❑ Basically, there are two ways lying ahead
 - ❑ Involve extra materials to improve contact, such as surfactant, PVP
 - ❑ **Dig out what causes the bad contact and resolve it. Here we speculate the residual Li compounds, Li_2CO_3 and LiOH , on NMC surface**



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101069703.

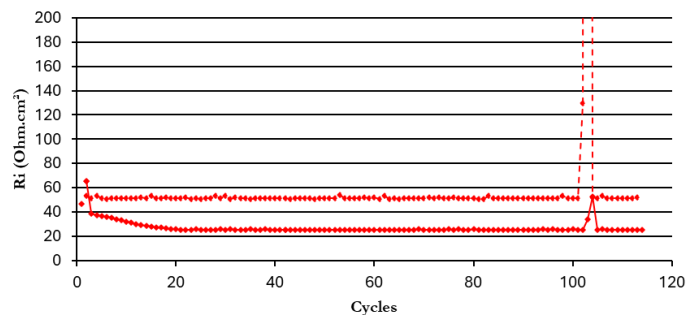
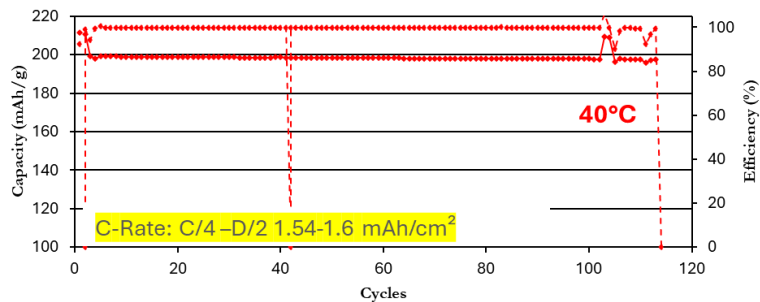
- Before we predict interaction energy calculation, we predict the activity of different materials, SICP, NMC, Li residual compounds. This can give us some hints in a simple way



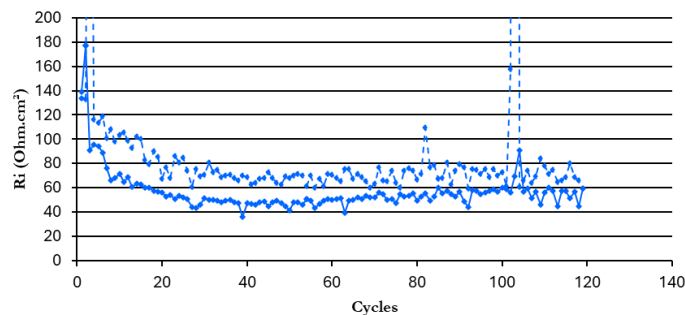
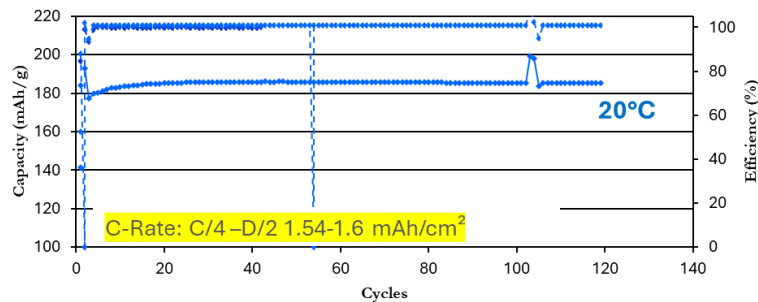
Blue Solutions
BOLLORE

Electrochemical characterization in the prototype cell

a)



b)



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101069703.

Center for Development, Demonstrations and Training for Carbon-Free Technologies



until 06/2026

32.559.359 EUR

JTF & cohesions funds & NIC cofinancing



KEMIJSKI INŠTITUT



Center za razvoj,
demonstracije in usposabljanje
za brezogljne tehnologije



I FEEL
SLOVENIA



Sofinancira
Evropska unija



KEMIJSKI INŠTITUT



REPUBLIKA SLOVENIJA
MINISTRSTVO ZA VISOKO ŠOLSTVO,
ZNANOST IN INOVACIJE





Vision

To create conditions for the development of modern technologies for energy conversion and storage

To contribute to the development of the region and beyond in the field of green transition technologies

To become a globally recognized center as a technology transfer bridge



Source: Museum Zagorje





What

Modern and top tier research center, part of the National Institute of Chemistry

Two independent labs will operate within the center.

More than
2.000 m² advanced
research
infrastructure linked
to the research
environment of the
National Institute of
Chemistry

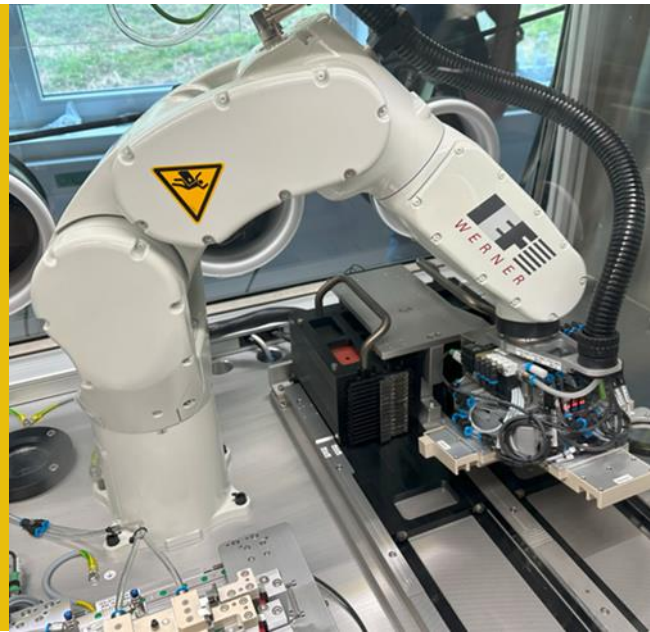




Goals

- Pilot testing for industrial innovation
- Education and training on zero carbon technologies
- Linking with international research communities
- Linking with the economy
- Setting up novel research infrastructure in Slovenia and the wider region

**Accelerating
transfer of
knowledge from
research units
into industry
and commercial
use**

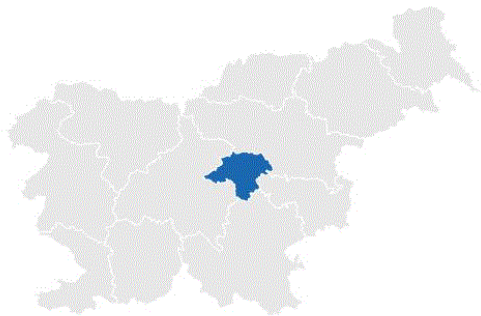


Where

Kisovec

Zasavje region

Fast access to
Ljubljana in Maribor
(University towns) and other
important cities (Graz,
Zagreb, Munchen, Budapest
Northern Italy,.....)



Zasavje region



Concept

I.

Laboratory for battery development
and testing

II.

Laboratory for demonstration
of H₂ and CO₂ technologies





Laboratory for battery development and testing

- ❑ Pilot line in clean and dry rooms (dew point between -40 to -60°C)
- ❑ Small pilot line in argon atmosphere (dew point < -80°C)
- ❑ Testing of battery cells in climate chambers (close to 500 channels for testing)
- ❑ Cryo FIB microscope
- ❑ Small equipment related to battery production



Modified based on <https://liplanet.eu/>





Laboratory for demonstration of H₂ and CO₂ technologies

- ☐ Development, synthesis, preparation and characterization of materials, especially catalysts, sorbents, electrodes and membranes
- ☐ Electro –chemical/ -catalytic production of hydrogen
- ☐ Processes for the transformation of hydrogen and carbon dioxide
- ☐ Including support to cross-cutting topics of renewable energy use and challenges of waste valorization.

