GeoDict

The Digital Material Laboratory

Batteries

The Motivation

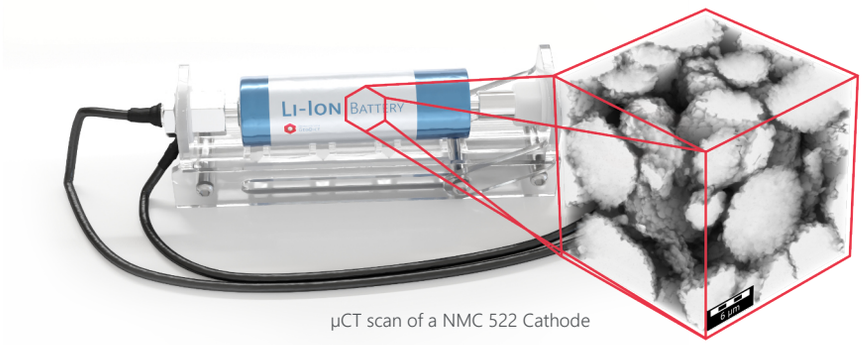
Multiple battery applications - from our phones to electric cars - require customized battery electrodes. Help to drive progress by exploring cutting-edge solutions for the demanding loading profiles, safety concerns, longer lifespan and eco-friendliness, while increasing energy capacity. Push your limits in battery development by including insights from microstructural simulations into your engineering process.

Our Solution

GeoDict is an all-in-one software tool for digital material design. With its user-friendly interface and powerful modules, GeoDict is the ideal tool for investigating the microstructure of battery materials and optimizing their performance. Experience the ease of rich analysis, accurate prediction and stunning visualization with GeoDict. Develop innovative materials digitally!

Your Benefit

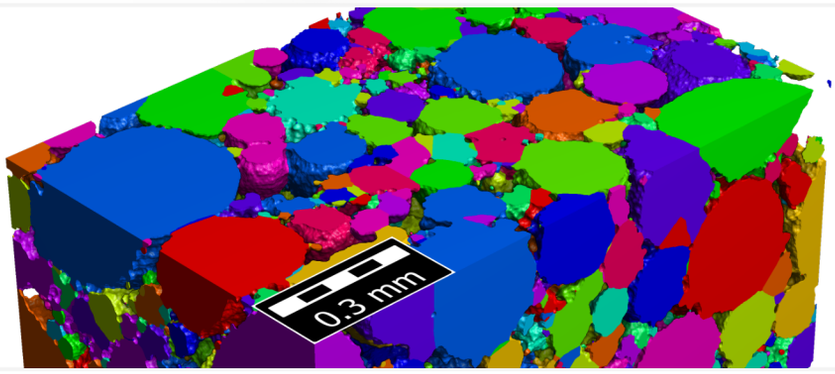
Transform your battery material research and development with GeoDict. Save time and money with simulations. Gain valuable insights into the inner workings of your battery materials that laboratory experiments cannot provide. Complement your experiments and directly identify and correct any weaknesses. Optimize your research by including simulations.



µCT scan of a NMC 522 Cathode

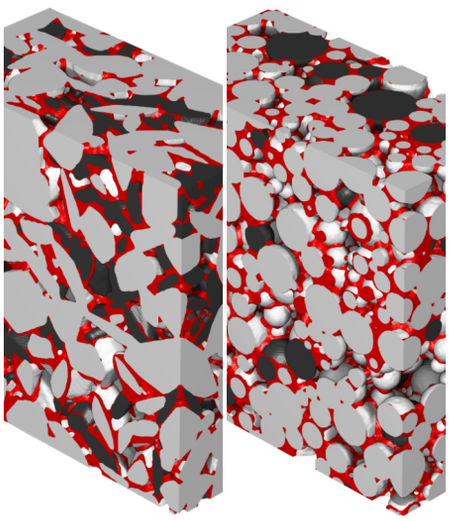
Digitalization

Import a 3D scan of the electrode microstructure. Image filters and AI tools help to segment the scan. E.g. artificially add non-visible phases or use a Neural Network to segment non-infiltrated samples.



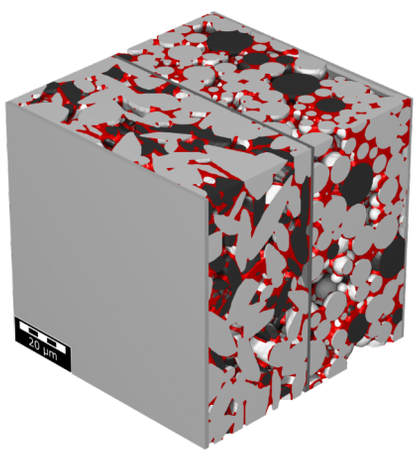
Material Analysis

Analyze the particle and pore size distribution through AI. Calculate tortuosities, identify inhomogenities and unfavourable binder accumulations in the electrode. Discover the bottlenecks in the conduction and diffusion pathways.



Generated Anode

Generated Cathode



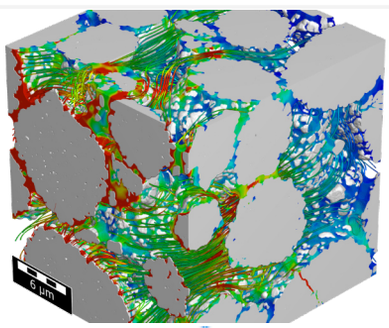
Generated Electrode with Current Collectors

Microstructure Design

Generate three-dimensional models of electrode materials. Use GeoApps and enter input parameters, as given by the manufacturers, to model realistic anode and cathode microstructures. For cutting-edge materials, GeoDict provides a variety of options to customize your model.

Determine:

- 3D Li^+-Ion concentration
- Ionic and electric current density
- Ionic flux densities
- Local overpotential sources
- Von Mises stress and strain

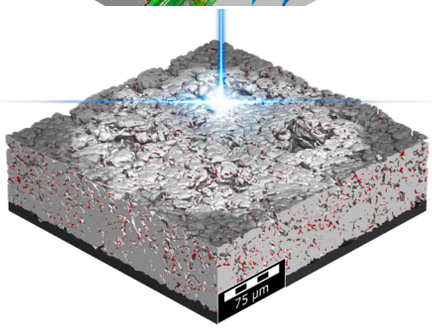


Electrode Performance

Optimize the properties after engineering the microstructure. Track down contributions to the overpotential, get local lithium concentrations and visualize stress/strains during lithiation.

Analyze:

- Tortuosity
- Particle size distribution
- Binder distribution also in µCT scans
- Diffusivities
- Electrical and thermal conductivity



Digital Prototyping

Test multiple microstructures to find an optimally performing electrode. Build and test only the best digital electrode prototypes.

Math2Market GmbH | Richard-Wagner-Str. 1 | 67655 Kaiserslautern, Germany
☎ +49 631 205 605 0 +49 631 205 605 99 electrochemistry@math2market.de
www.GeoDict.com

MATH 2 MARKET