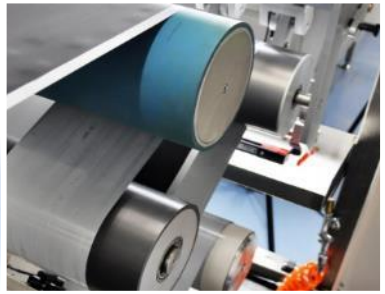
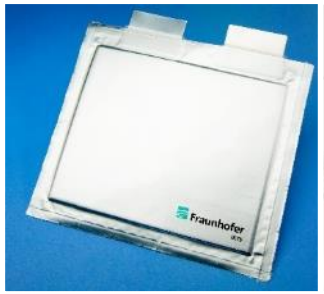
Fraunhofer IKTS (Institut für Keramische Technologien und Systeme)
Li-Ion battery along the value chain

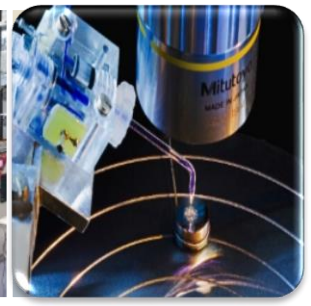
Annual Budget: 77 Mio. €

Staff: 800





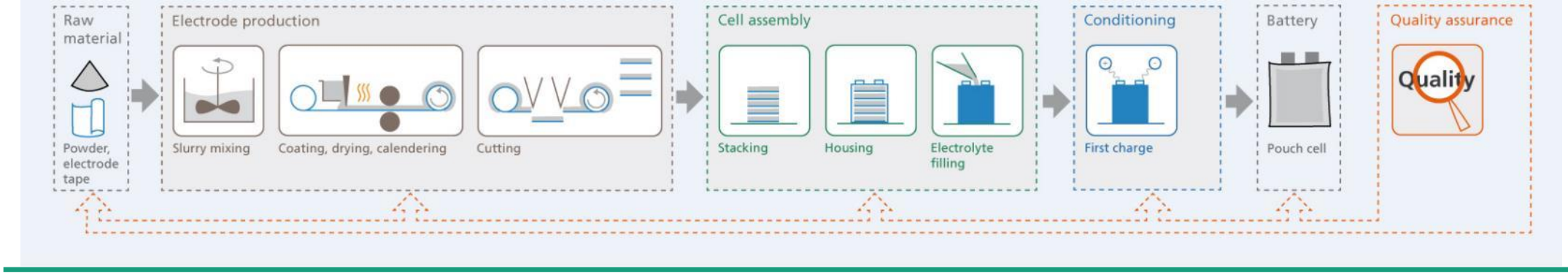



Synthesis	Slurry preparation	Electrode development	Cell assembly	Testing
Active materialies, separator	Mixing	Casting, drying, calendering	Cutting, stacking, electrolyte filling, packaging	Formation, aging, EoL test

Recycling

IKTS koordiniert den „green battery“ cluster im BMBF Dachkonzept Batterie (hierzu gehört auch die FFB)



Fraunhofer IKTS

New IKTS Battery Pilot Line in Arnstadt

Westansicht Verwaltungsgebäude mit zentralem Zugang und Behindertenstellplatz

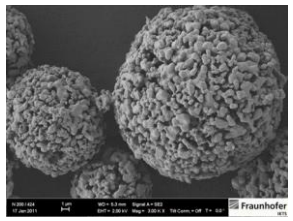
area: 5.300 qm

BITC:
Battery Innovation and Technology Center

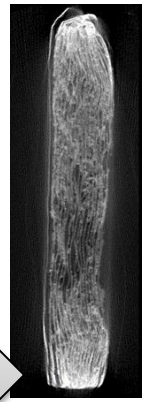
Freistaat Thüringen
Ministerium für Wirtschaft, Wissenschaft und Digitale Gesellschaft

CATL
solid power inside

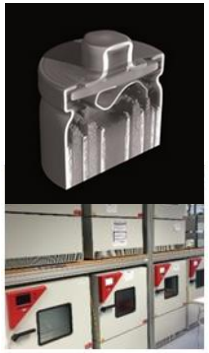
Batteries



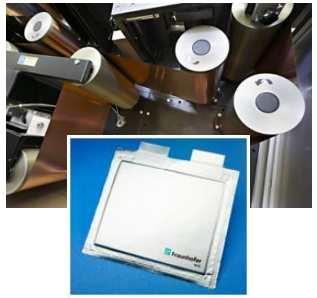
Materials & Scale-up



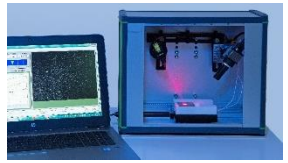
Analysis & Test



Design & Production

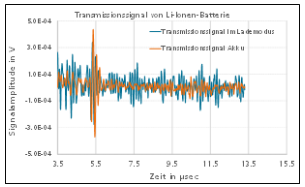


Internet of Things / Production / Data



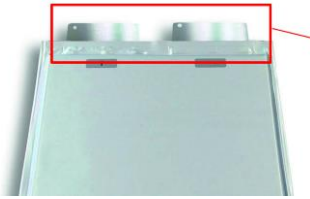
Advanced sensors

Machinery and tooling



Data science and AI

Imaging and NDT

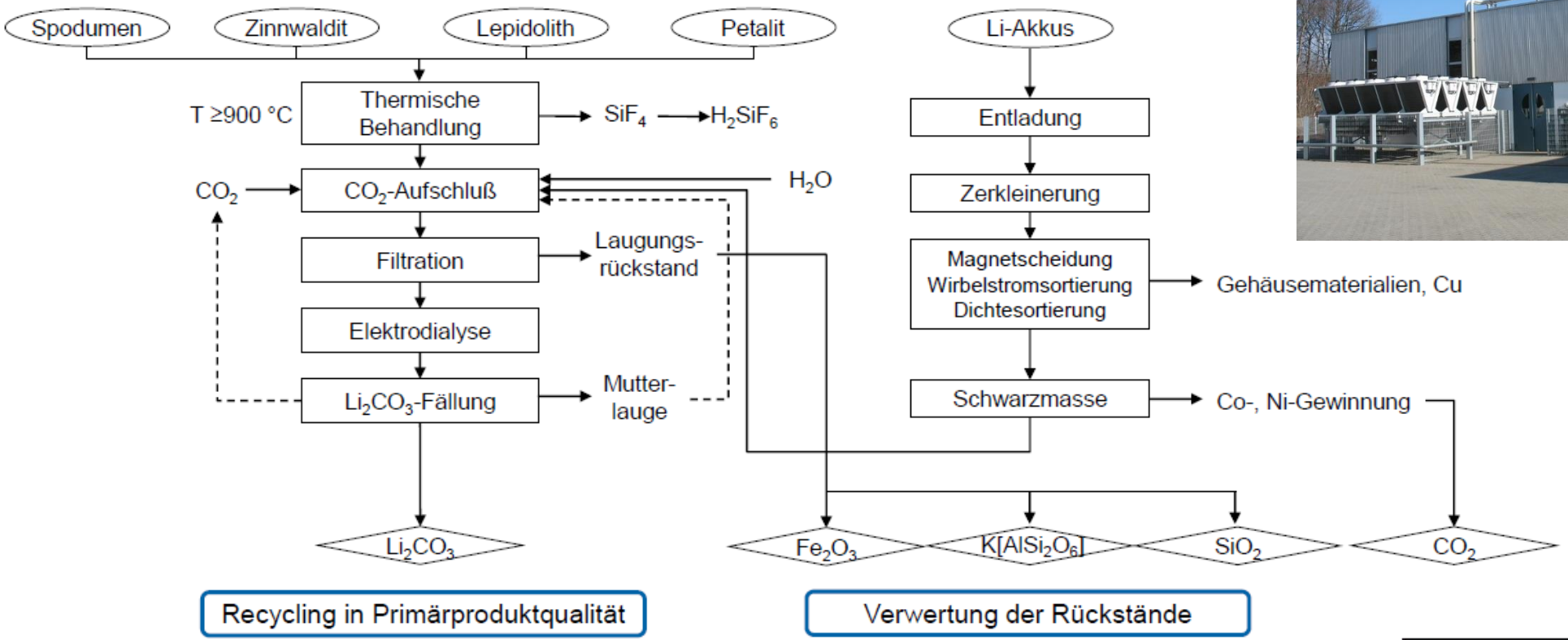


Fraunhofer IKTS

Battery Recycling

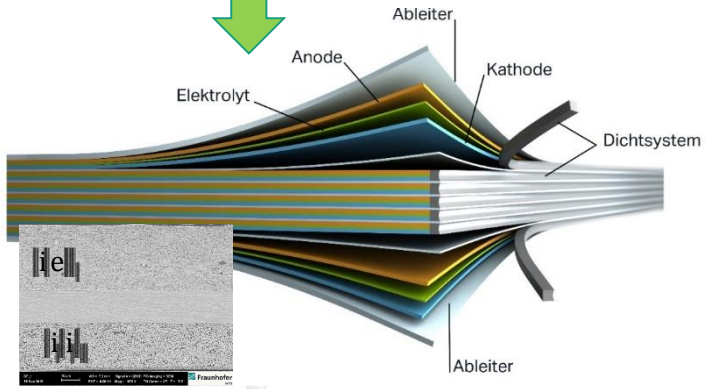
COOL-Prozeß

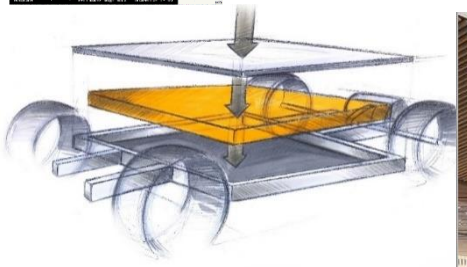
Digitalization of Recycling Processes



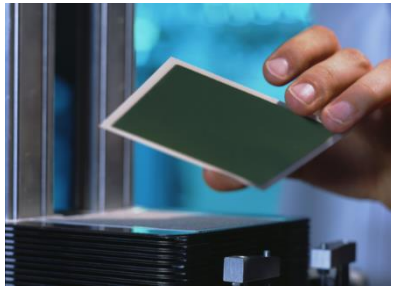
M. Bertau, G. Martin, C. Pätzold, DE 1020152217590; M. Bertau, G. Martin, DE102016204360.9; H.-G. Jäckel,, U.A. Peuker, L. Wuschke, *Chem. Ing. Tech.* **2014**, *86*, 806-813; G. Martin, C. Pätzold, M. Bertau, *Int. J. Min. Process.* **2017**, *160*, 8-15; G. Martin, A. Schneider, W. Voigt, M. Bertau, *Min. Eng.* **2017**, *110*, 75-81.

Bipolar Battery / Solide State Battery / Fuel Cell

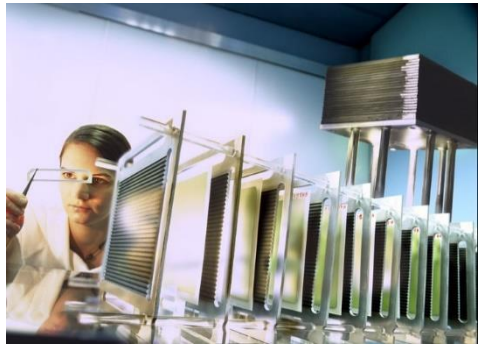




PEM-FC



SOFC



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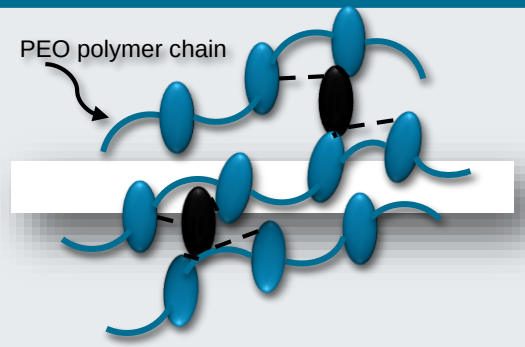
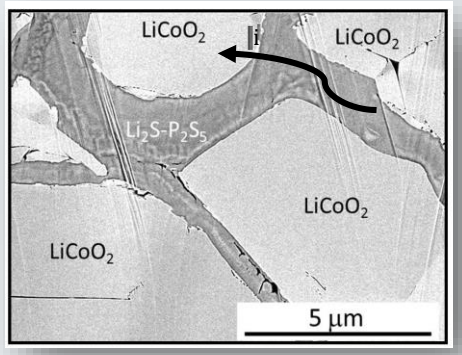
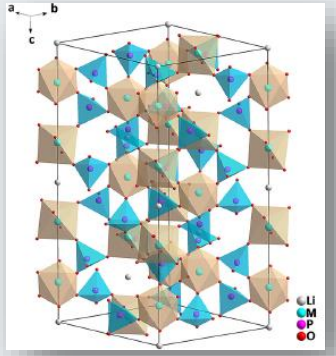
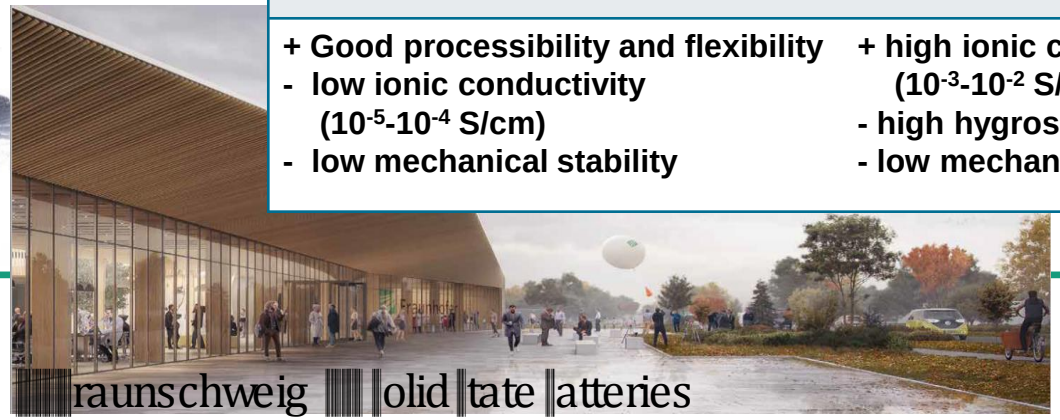
		
T. Niitani, et al., Electrochemical and Solid-State Letters 8 [8] A385-A388 (2005).	*A. Sakuda, et al., Scientific Reports 3, 2261 (2013).*	*Y. Ren et al., J. Am. Ceram. Soc. 98 [12] 3603-3623 (2015).*
+ Good processibility and flexibility - low ionic conductivity (10^{-5}-10^{-4} S/cm) - low mechanical stability	+ high ionic conductivity (10^{-3}-10^{-2} S/cm at RT) - high hygroscopicity - low mechanical stability	+ good ionic conductivity (< 10^{-3} S/cm at RT) + stable against air and high temperatures



Fraunhofer IKTS

Stationary Storage based on low cost, environmentally friendly, safe, and easily acessible materials.
Stationary storage market is bigger than mobil storage !

$$NiCl_2 + 2Na \leftrightarrow Ni + 2NaCl, \quad E_0 = 2{,}58\ V$$

- cerenergy® – $Na/NiCl_2$ battery system for stationary energy storage
  - Basis: inexpensive local raw materials
    material cost < 30 $ kWh
  - Extremely safe, as no spontaneous combustion can occur
  - Low system costs (no T control / simpel BMS)

- Application:
  - Ideal for stationary storage in combination with renewable energies (solar and wind energy)

cerenergy® – $Na/NiCl_2$ battery system for stationary energy storage.

Fraunhofer IKTS