InQuBator: Collaboration Project on Position-Accurate Traceability of Quality Characteristics and Process Parameters in Battery Cell Production

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Motivation & Goal

- Digitalization of battery cell production offers enormous potential for optimization to meet the high quality demands while keeping production as cost-effective as possible.
- Data-driven processes can make production more sustainable and optimize quality, by controlling processes to minimize waste.
- In the project InQuBator, we (Fraunhofer FFB, Fraunhofer IPT, and BST GmbH) demonstrate an approach for position-accurate allocation of quality characteristics and process parameters using the example of a coating and drying machine. This can serve as a basis for aggregating the data required for effective battery cell production and enables traceability.

Approach

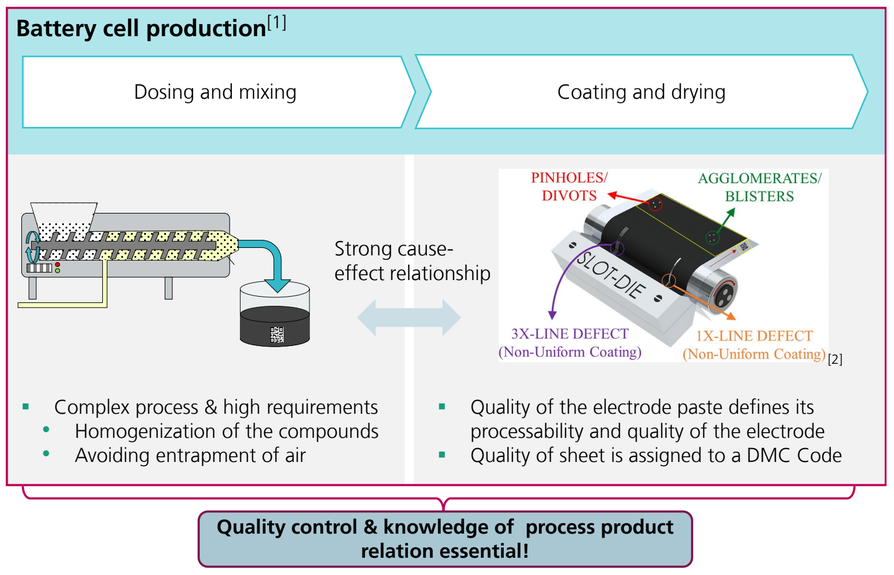

Fig. 1 Importance of understanding cause-effect relationships based on the example of the »FFB Workspace«

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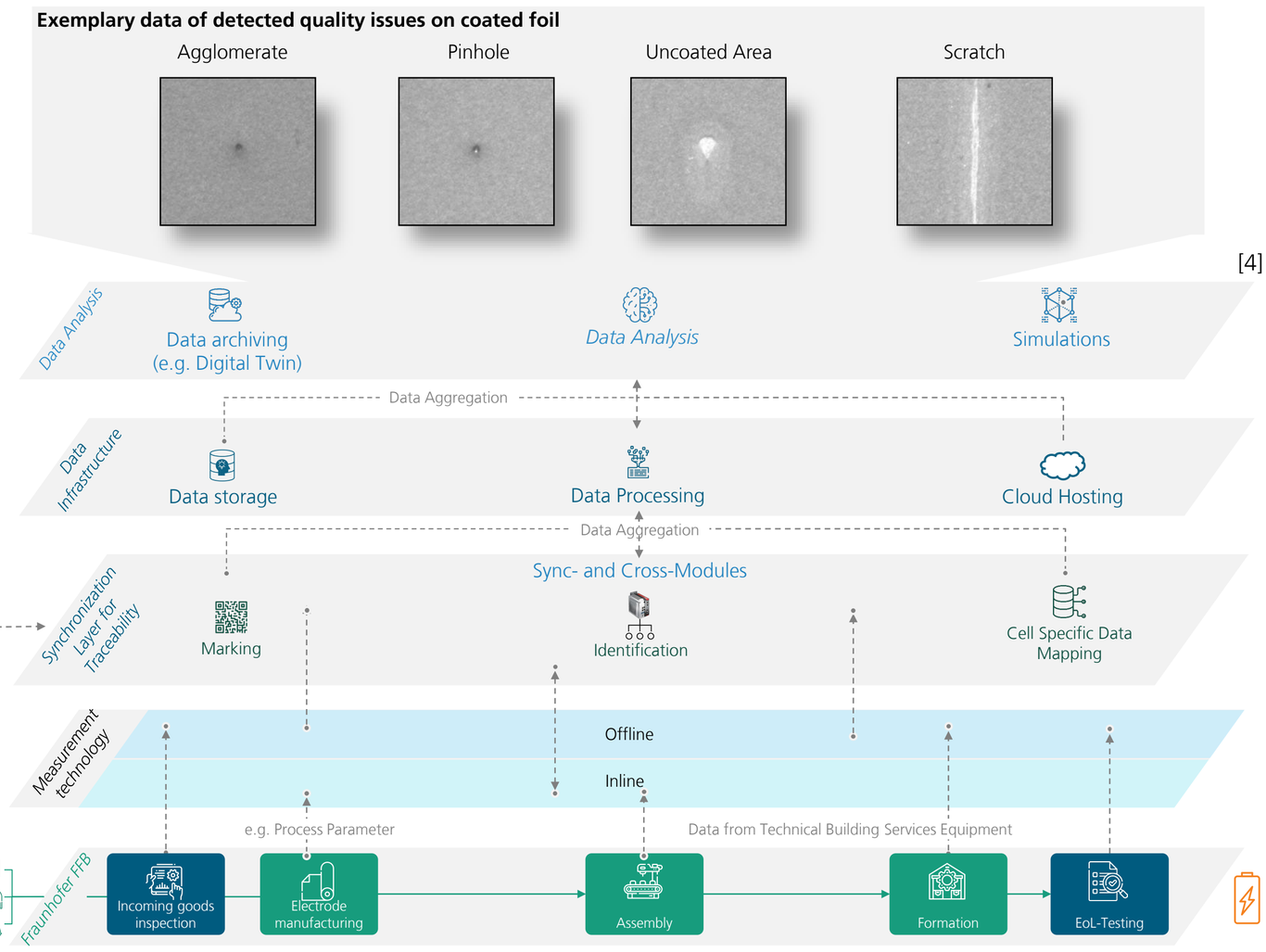

Fig. 2 Big Picture of position-accurate data documentation with exemplary data of a coating process.

Insights into collaborative project and outlook on further work

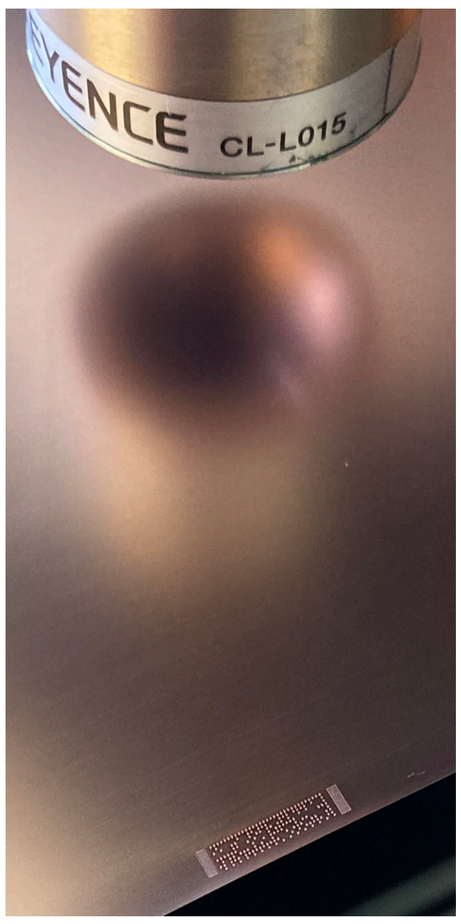

Fig. 3 DMC Laser marking

Fig. 4 Laser and laser enclosure

Fig. 5 Laser enclosure

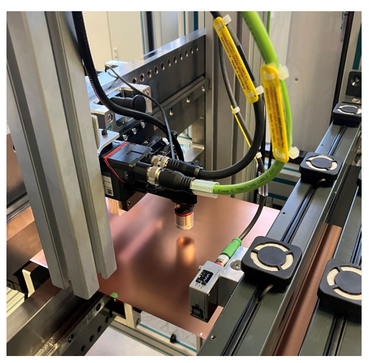

Fig. 6 Inline camera for defect detection and scanner for reading DMC codes

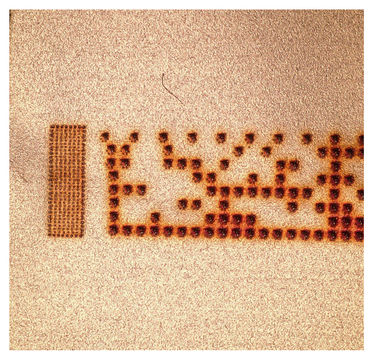

Fig. 7 Microscopic view on DMC code (2mm x 8mm)

Outlook on further work in collaborative project

- Further adaption, testing, and validation of the DMC code and its readability:
  - Size and design
  - Frequency on electrode band
  - Quality
  - Conception of code for use in production lines with line speed up to 80m/min
- Integration of further measurement technology and process data for position-accurate data allocation

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[3] Lamuel, D., et al., Identifying degradation mechanisms in lithium-ion batteries with coating defects at the cathode, *Applied Energy 231* (2018): 446-455.
[4] Kies, A., et al., Der digitale Zwilling in der Batteriezellfertigung, *Werkstattstechnik online 111* (2021): 286-290.

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