

Testing of filling and wetting processes in battery cell production

Ultrasonic transmission measurements

Ultrasonic transmission measurements are excellently suited for non-destructive testing of filling and wetting processes of pouch cells during battery cell production. An ultrasonic system developed at Fraunhofer IKTS, based on a PCUS® pro Array ultrasonic electronics, is used for monitoring the wetting process of lithium-ion battery cells (LIB).

Measuring principle

The probes are fixed to the front and the back of the cell. The measurement is performed by transmission of ultrasound through the cell during filling. A visible change in the received signals in relation to filling and wetting is detectable (diagram 1). The propagation path and the energy of the sound waves are strongly influenced by the impregnation of the cell body with electrolytes in the pore volume. The wetted cell shows less attenuation of the ultrasound wave than a dry cell.

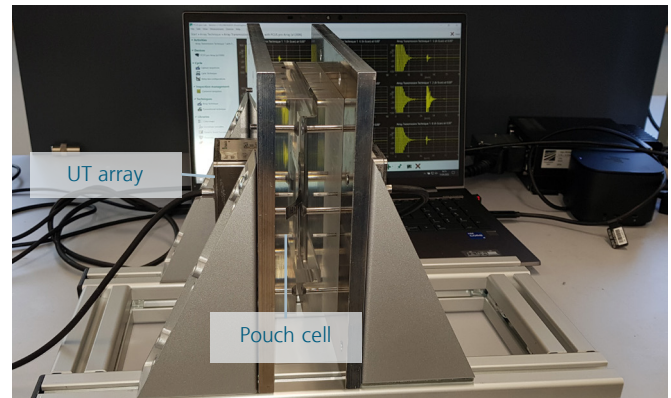
More details about the filling process are obtained from the signal waveform of the ultrasonic receivers (diagram 2). The faster increase of the signal amplitude at the beginning corresponds to the macroscopic wetting of the cell. The subsequent slower signal change is attributed to the microscopic wetting.

Design of the ultrasonic sensor array

Based on dice-and-fill technology, array probes with external dimensions of 60 mm x 60 mm were fabricated. Each electrode element has an edge length of 12 mm x 12 mm (aperture). The arrays were designed to operate at frequencies of 2.5 MHz and 3.0 MHz, respectively.

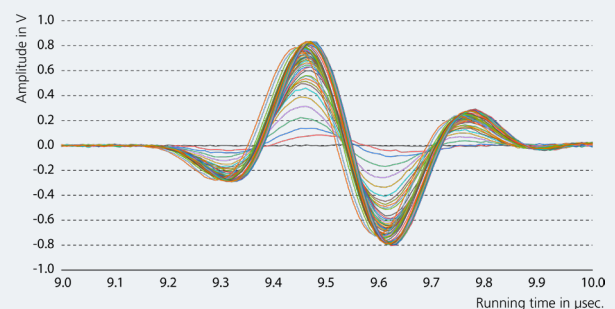
With this transmission setup, test pouch cells can be tested over the entire surface. This makes time- and spatially-resolved wetting monitoring possible for the first time.

Contact us for more about the possibilities of non-destructive testing of filling and wetting processes of pouch cells in battery cell production.

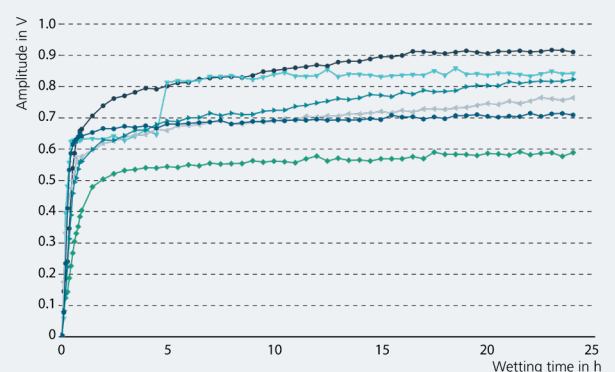


Laboratory test stand using array probes for monitoring the filling and wetting process in a pouch cell.

Amplitude increase and transit time increase of UT signals during pouch cell wetting



Amplitude increase and comparison of UT signals during pouch cell wetting



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