

Terahertz Measurement Technology for Checking the Coating of Battery Foils

In the coming years, 1,000 production lines for electrode foils are to be built in Europe; similar figures apply to Asia and North America. Only non-contact systems can be used to monitor quality inline during production. This is why researchers in the “Material Characterization and Testing” department have expanded their expertise in terahertz measurement technology for inline coating control of battery foils.

The production line here refers to the equipment for coating the electrodes. The coating is usually applied as a liquid – called slurry – to copper or aluminum foils. For optimum battery performance, the coating must meet high requirements in terms of layer thickness and homogeneity. Until now, the industry has used beta and X-ray radiation to determine the layer thickness. These have the disadvantage that they only measure the total thickness, i.e. the film including the coating, and therefore require differential measurements before and after coating. If measurements are not always taken at the same strip position, the measurement errors add up drastically.



highly absorbent and electrically conductive layers.

Coating Thickness Measurement With Terahertz

“We measure the cathode coating with terahertz TDS, as we use it to measure paint coatings in the automotive industry.” This allows 1,000 measurements per second. The conductivity of the anode is higher than that of the cathode. Their coating can be measured using photonic terahertz FMCW – a new measuring principle. Several manufacturers are already working on the dry coating of battery foils, which significantly reduces CO₂ emissions by shortening the drying process and thus improves the environmental balance of the manufacturing process. The use of terahertz measurement technology is particularly advantageous here, as beta and X-ray radiation cannot be used for process-related reasons.



The cathode carrier material consists of aluminum, with a layer thickness of between 30 µm and 300 µm. Copper is used as the carrier material for the anode.

New Sensor Technology Makes You Flexible

Terahertz radiation can be used to measure faster and more accurately. “This technology measures in reflection and thus directly records the coating thickness; it takes less than five milliseconds for a measurement,” explains project manager Dr. Joachim Jonuscheit. The new sensor technology can be flexibly adapted to the respective task in terms of the number and position of the measuring heads as well as the measuring frequency. The optimization to frequencies between 50 GHz and 1 THz, frequency stabilization through improved driver electronics and adapted signal processing enables precise thickness measurements on thin,

Contact

Dr. Joachim Jonuscheit
Deputy Head of Department “Materials Characterization and Testing”
Phone +49 631 31600-4911
joachim.jonuscheit@itwm.fraunhofer.de

