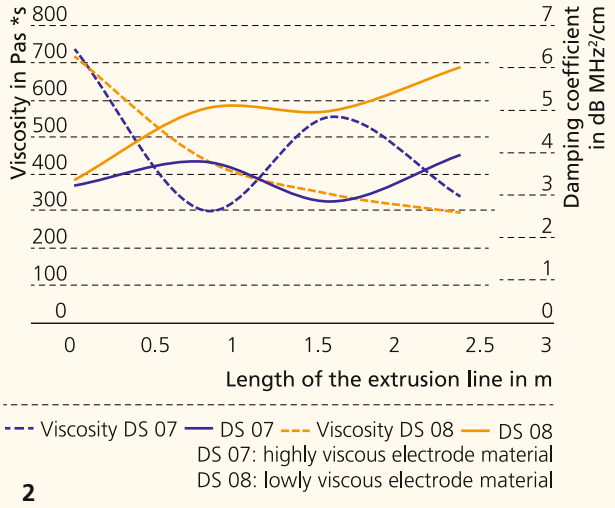
1



2

MONITORING OF THE EXTRUSION PROCESS IN THE PRODUCTION OF BATTERY TAPES

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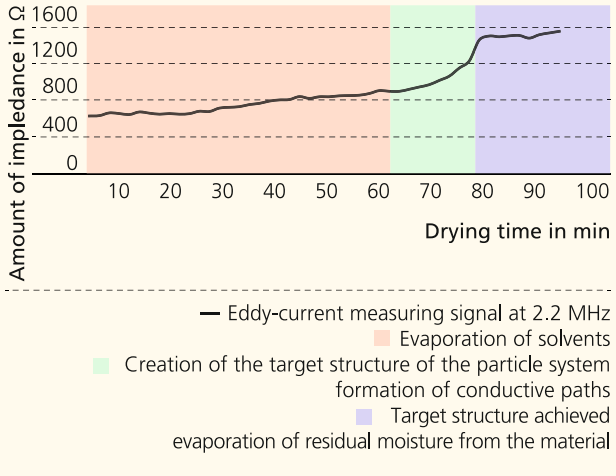
Electromobility is becoming an essential market. Core elements of this market are the battery cells, whose production is at present not yet sufficiently economical. One approach to this problem is to increase production efficiency through lower reject rates and thus raising profitability. To achieve this, an inline monitoring system can be used, which non-destructively inspects during the electrode manufacture and detects defects or changes in the material composition as early as possible.

For this purpose, a multisensory mouthpiece was installed between the extruder outlet and the coating tool (Figure 1) of a twin-screw extruder for battery electrode manufacture. It uses the eddy-current and ultrasonic methods to monitor battery electrodes. The combination of both measuring methods makes it possible to record a wide range of material parameters.

The monitoring of acoustic material properties, such as density, viscosity or particle size, makes use of the parameters of sound velocity and sound attenuation, both stemming from the ultrasonic method. The eddy-current method makes it possible to monitor the electrical and dielectrical properties of materials using test frequencies from 1 to 10 MHz. In ultrasonic testing, the test frequencies for transmission measurements are between 1 and 5 MHz. Figure 2 shows that the viscosity changes as the extruder length increases. Such a change in viscosity leads to different damping coefficients in the ultrasonic method. This information can be used to adjust the process at an early stage, avoiding faults in production. In addition to viscosity, further correlations with the density of the active material component and the electrical and dielectric material properties could also be demonstrated. The monitoring of how battery tapes dry can be realized with a single or area sensor for eddy currents. Based on the definition of the drying state (diagram below), these measuring systems enable a higher production speed as well as reproducibility. This is possible e.g. by installing a shorter drying line.

Eddy-current drying monitoring of an anode material with LTO (lithium titanium oxide) active material at a measuring frequency of 2.2 MHz



1 *Multisensory mouthpiece for the monitoring of battery cell production.*

2 *Correlation between viscosity and ultrasonic signal during in-line monitoring.*

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