Monitoring properties of alumina slurry using inline accousitc and electriacl sepectroscopy technology

Dirk Hofmann[1], Martin H. Schulze[1], Susan Walter[1], Henning Heuer[1], Eui-Chan Jang[2], Dong-Hyun Yun[3], Ji-Su Ahn[3]

[1]Testing Systems, Fraunhofer IKTS, Germany, [1]Battery Division, Nanointech Co., Ltd., Republic of Korea, [1]Battery Division, Nanointech Co., Ltd. , Republic of Korea

Slurry, especially graphite or alumina-based material systems are extensive used e.g. in battery production. The properties of these material systems are determined by the quality of the incoming materials and its further processing in mixers, mills or coating systems. In order to ensure a constant quality of the final product, the quality of the slurry needs to be monitored inline without interfering with the process stream. One parameter that can be used to measure or record these changes is the viscosity. This can change due to properties such as solid content, its distribution, and the particle size, and can affect other properties such as conductivity, carbon black content or the homogeneity. In the industry, viscosity and its properties are often measured by off-line analysis. At Fraunhofer IKTS in Germany a sensor system has been developed that can continuously monitor these property changes inline. The development of sensor technology and electronics is based on a combination of eddy current for inductive electrical impedance spectroscopy and ultrasonic (acoustical spectroscopy), whereby the inductive and viscoelastic changes in the material are continuously detected and evaluated. In cooperation with Nanointech, a company based in South Korea, the properties of aluminum oxide were investigated over several machining and processing stages as part of a feasibility study. The different conditions formed the framework of the study. First, a static and dynamic analysis was carried out under laboratory conditions to derive a characterisation of the sensors for the material system and their properties. These results were verified through an on-site investigation of slurry manufacturing equipment for the ceramic-coated separator (CCS) manufacturing line of lithium secondary battery manufacturing. At each stage of the study, the degree of scaling was increased at all levels. The article presents the study, its conditions, and the experimental set-up as well as the results and assesses the insights that can be derived from it for further activities.