Better batteries through perfect material mixing: Anode, cathode and separator mixing with Hauschild SpeedMixer®

Battery slurries are very viscous, contain raw materials that need to be deagglomerated and require reproducible mixing.

DETROIT/HAMM, MICHIGAN, USA/GERMANY, October 27, 2021 /EINPresswire.com/ -- The production of high-quality battery slurries presents many challenges: They are very viscous, contain raw materials that need to be deagglomerated and require highly repeatable/reproducible mixing. Hauschild is therefore presenting its SpeedMixer®, which can be used to mix almost any viscosity, at the Battery Show Europe Conference. The power of these centrifugal mixers is so high that particles are reliably deagglomerated and air bubbles and voids are eliminated. Automated programs ensure repeatability.

Hauschild SpeedMixer® mixes homogeneous slurry in a few minutes

The development of high-performance batteries is crucial to enable the effective use of renewable energy sources and to advance the electrification of vehicles, for example. All these developments undoubtedly rely on breakthroughs in materials. Optimizing the anode material is therefore an important area of research, and proper mixing is an essential part of the process.

For batteries, both anode and cathode are usually made by mixing active material (graphite), binder powder, solvents and additives (the keyword is "slurry mix"). This slurry is then pumped into a coating machine, which applies the mixed slurry to the aluminum foil for the cathode and the copper foil for the anode.

Challenge of mixing anodes

Anodes have a variety of compositions for different applications. The most common materials for anodes are carbon/graphite as the active anode powder, carboxymethylcellulose (CMC) as

the binder/film former, plus conductive materials and additives, and deionized water as the solvent. Mixing these components then depends on a lot of know-how and experience. Fabio Boccola, CEO of Hauschild Engineering, reveals the procedure required to ensure that the mixing result is convincing. "First, the binder is dispersed in the other powders by dry mixing. CMC tends to clump when added directly to water. Therefore, we recommend using our Hauschild SpeedMixer® to first dry mix the CMC powder with the carbon/graphite powder for about 30 seconds at medium speed. This disperses it and prevents clumping when added to the water. The viscosity/solids content can also be adjusted to the desired values in the final step. In addition, we recommend using a mixing container with a lid that has a small hole in the center to prevent pressure buildup. Mixing under vacuum removes voids/bubbles, dissolved gases and gases adsorbed to fillers/powder."

The world needs better batteries - and we are proud to be involved in many new innovations

Mixing cathodes and separator foil

Active cathode materials are the main elements that determine the compositional differences in the manufacture of positive electrodes for battery cells. The cathode materials consist of cobalt, nickel and manganese, which form a multi-metal oxide material in their crystal structure to which lithium is added. The optimization and testing of materials is becoming increasingly important for the further development of battery technology as the demand for more powerful batteries continues to rise.

> The original Hauschild SpeedMixer® enormously shortens the product development, analysis and quality assurance process in laboratories. It mixes homogeneous battery slurry in a few minutes."
>
> *Fabio Boccola, CEO of Hauschild Engineering*

Fabio Boccola explains, "Dissolving the binder polyvinylidene fluoride (PVDF) in the solvent N-methyl-2-pyrrolidone (NMP) can be an hours-long, time-consuming process in conventional equipment. It is common for laboratories to pre-dissolve a concentrate to save time in each formulation. Preparing a concentrate in a Hauschild SpeedMixer®, on the other hand, is usually done in less than ten minutes."

In addition to the cathode and anode mixture, the separator film required between the cathode and anode can also be produced quickly and safely. The separator, which - as the name implies - physically separates the anode and cathode, is a microporous compound usually based on

plastics such as polypropylene or polyethylene.

While the material itself is much easier to mix than the much more viscous components of the cathode and anode, the challenge in mixing the separator is the homogeneity required. Voids in the final mix must be minimized to create more lithium storage sites.

In R&D laboratories, Hauschild SpeedMixer® are an essential piece of equipment

The secret of success: use of centrifugal forces

DAC stands for Dual Asymmetric Centrifuge. The special feature of this mixing principle is the double rotation of the mixing cup. The combination of centrifugal forces acting in different planes enables an extremely efficient mixing process characterized by a homogeneous result - without the use of agitators. Almost 100 percent degassing is already achieved during the mixing process, removing even the smallest microbubbles. An additional degassing cycle is not required. Mixing units with vacuum technology are available for complete degassing. Programmable cycles ensure absolutely identical, reproducible mixing of each batch and result in a significant acceleration of the development process.

Fabio Boccola says, "In R&D laboratories, Hauschild SpeedMixer® are an essential piece of equipment. They are fast, highly efficient, dust-free, no further cleaning is required, and there is less impact on employees and the environment. Thanks to its extremely fast mixing, the Hauschild SpeedMixer® enormously shortens the product development, analysis and quality assurance process in laboratories. The world needs better batteries - and we are proud to be involved in many new innovations".

More info: www.hauschild-speedmixer.com

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