

Influence of Mixing Sequence on Structure and Processability in Dry Extrusion of Cathode Composites

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Motivation

“Dry Processing” = solvent-free electrode manufacturing



- Eliminates the need for energy-intensive drying and solvent recovery
- No use of toxic solvents (e.g., N-Methyl-2-pyrrolidone / NMP)
- Enhanced ion and electron transport due to porous structure

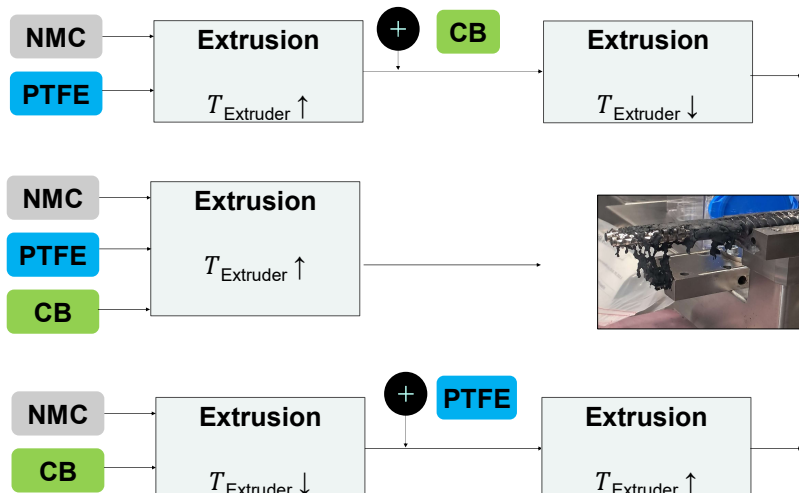
Ensuring **homogeneous distribution** of active material, conductive additives, and binders essential for consistent electrochemical performance

Extrusion-based mixing process of battery materials

- Offers **high flexibility** and thus good control of temperature and shear forces
- allows a **continuous**, roll-to-roll production process

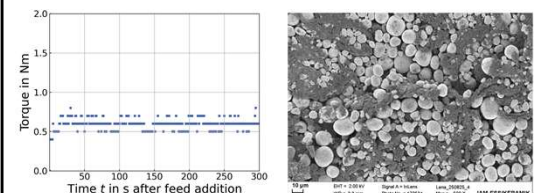
Methods

Dry mixing of cathode materials in a **Thermo Scientific Energy 11 parallel twin-screw extruder** with 11 mm diameter, variation of mixing sequence

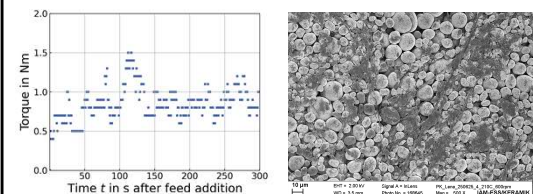


Results

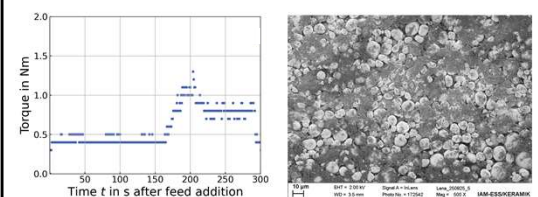
1) NMC PTFE 2) + CB



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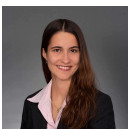
1) NMC CB 2) + PTFE



Simultaneous addition of PTFE, CB, and NMC

- **Higher torque values and higher fluctuations** in torque curve of last extrusion step indicate higher degree of fibrillation.
- SEM images show **thinner fibrils** and **better connection** between CB and NMC.

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