

The BASF logo, consisting of a white square with a smaller white square inside, followed by the letters "BASF" in a bold, white, sans-serif font.

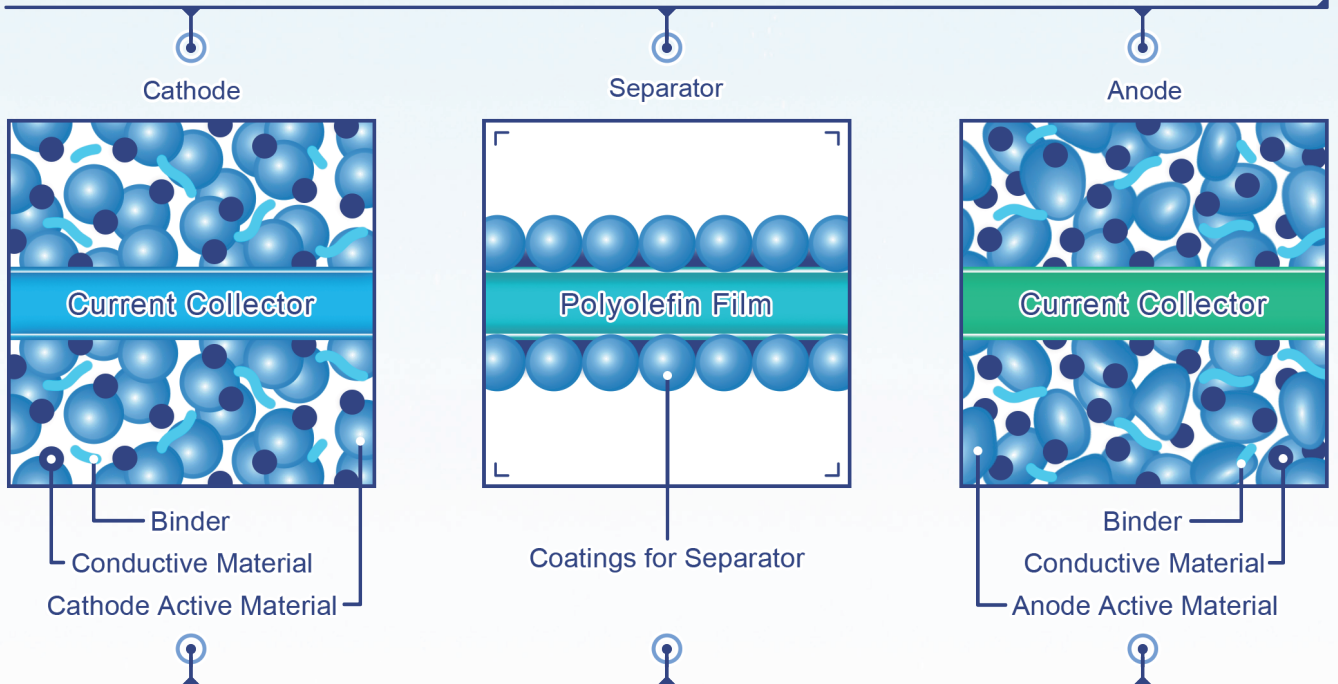
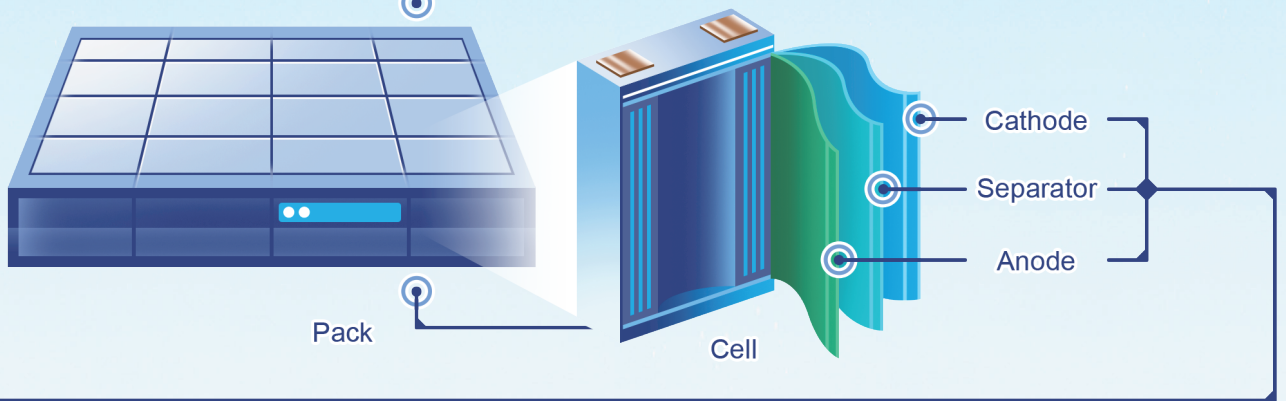
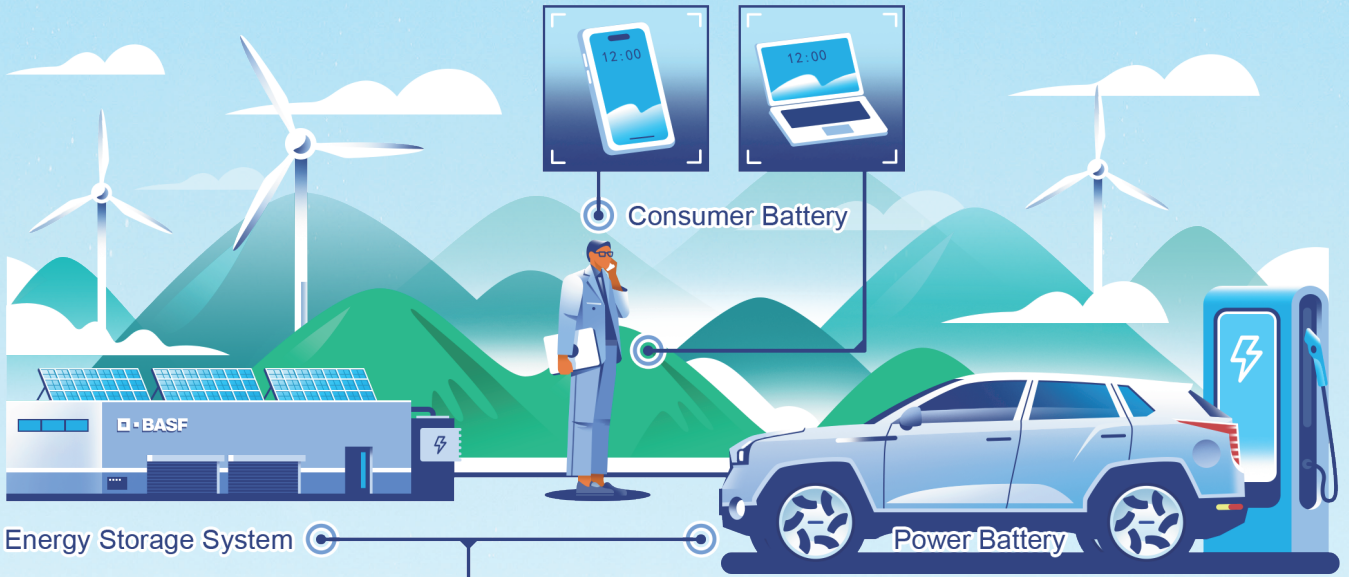
□ · BASF

We create chemistry

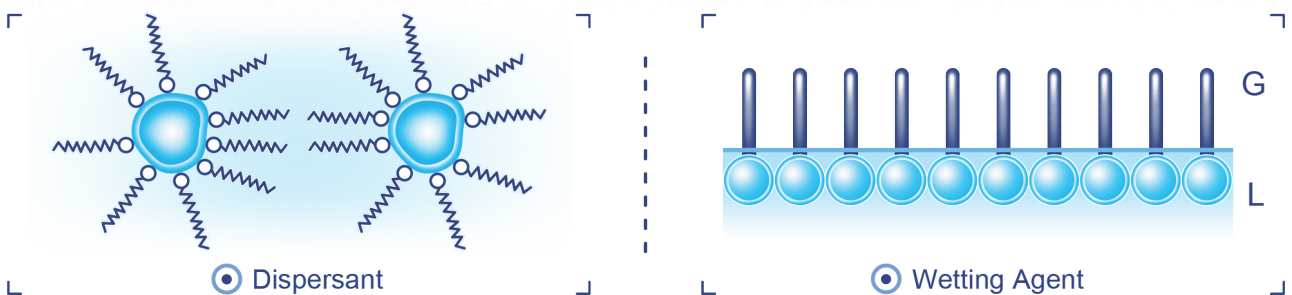
Powering Up Your Formulations

BASF Additives for Lithium-ion Batteries





► BASF Additives for Cathode, Anode and Coatings for Separator ◀



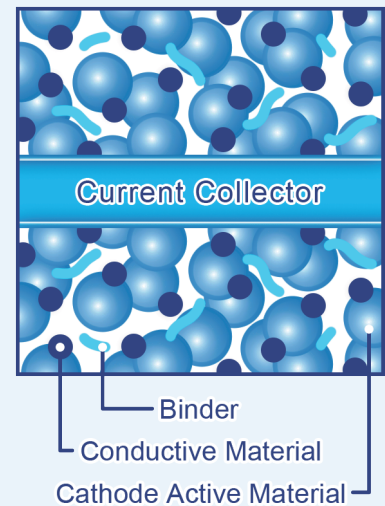
Why wetting and dispersing agents are beneficial for electrode slurry?

Benefits of wetting and dispersing agents in cathode active materials (LFP, LMFP, NCM)

- disperse cathode active materials with a much narrower particle size distribution, which improves batch to batch consistency during the slurry production
- reduce slurry viscosity and increase solid content
- improve total production efficiency of cathode slurry
- reduce usage of NMP and energy consumption for NMP recycling

Key end use and process application benefits

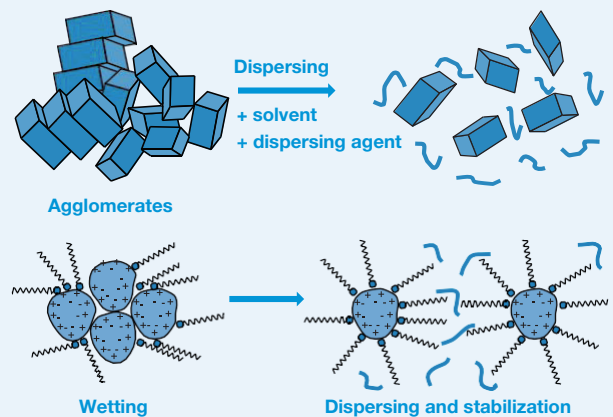
- improve dispersion of conductive materials and enhance conductivity of electrode
- reduce dosage of conductive materials and improve battery energy density
- improve dispersion / milling efficiency of conductive material slurry



How do wetting and dispersing agents work in electrode slurry preparation?

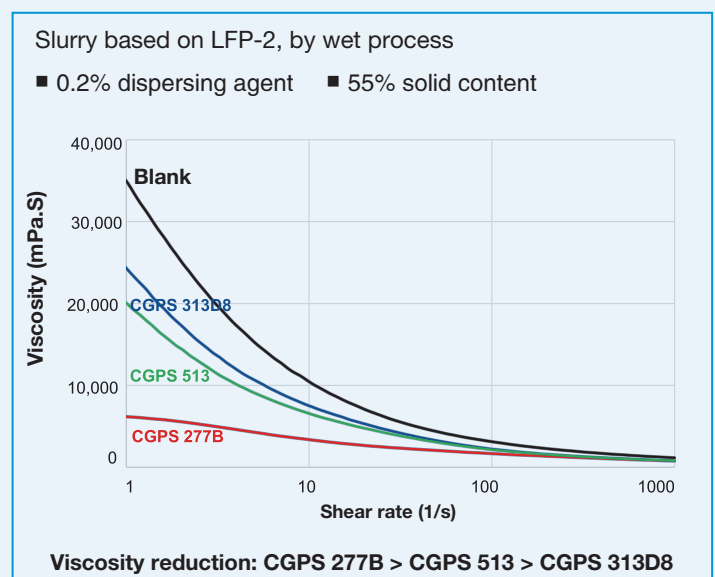
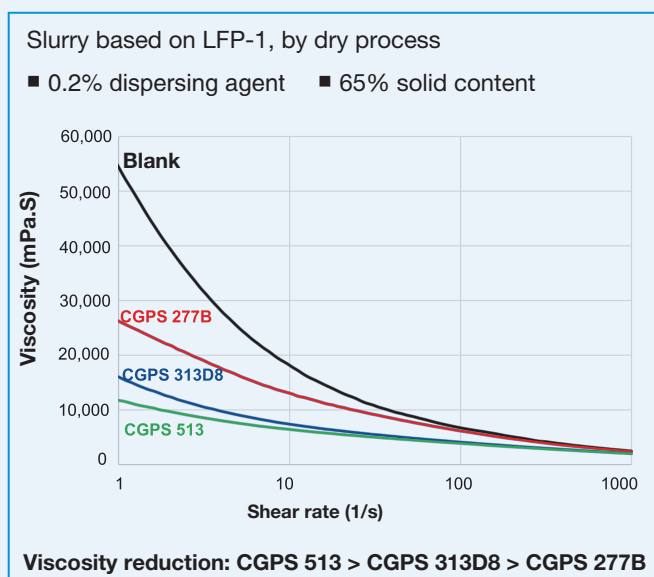
Dispersion process consists of three steps:

- **Wetting:** air and moisture on the pigment surface are replaced by the liquid of the grinding medium
- **Dispersing:** agglomerates are broken up by energy input and separated into smaller particles
- **Stabilization:** anchoring groups of a dispersing agent absorb onto the particle surface, the remaining polymer segments can be regarded as “dissolved” and stabilize the particles



Dispersing agents for LFP slurry: CGPS 277B, CGPS 313D8 and CGPS 513

- superior slurry viscosity reduction
- excellent electrochemical stability
- 2–6% increase in solid content (depending on LFP grades and slurry preparation processes)

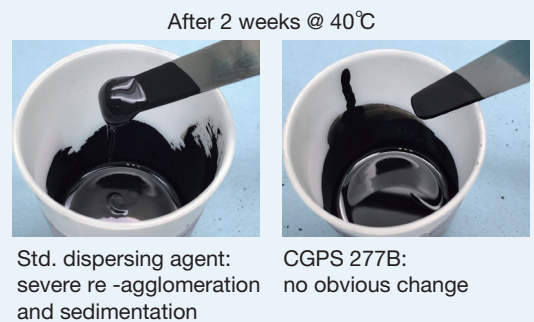
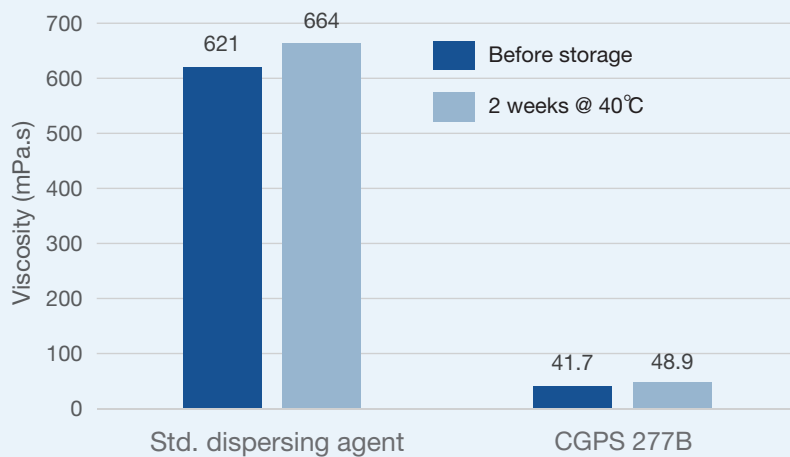


Conclusion: LFP composition and preparation process influence the dispersing aid selection.

Dispersing agents for conductive materials: CGPS 277B

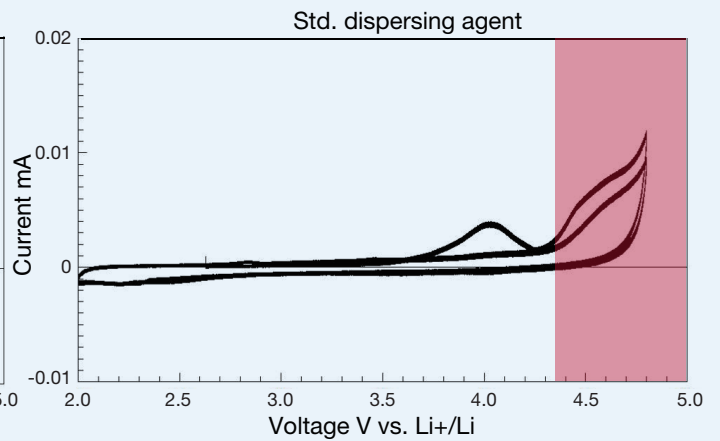
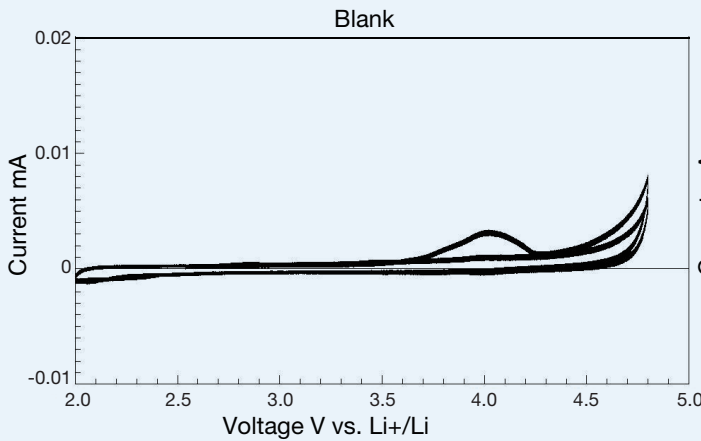
- excellent viscosity reduction for conductive materials, especially for carbon black
- improve dispersing / milling efficiency during slurry preparation
- improve storage stability of slurry

Formulation details: 20% carbon black, 2% dispersant, grinding media: Ø2 mm glass beads



Conclusion: Compared to standard dispersing agent, CGPS 277B shows much stronger viscosity reduction, improved storage stability and milling efficiency.

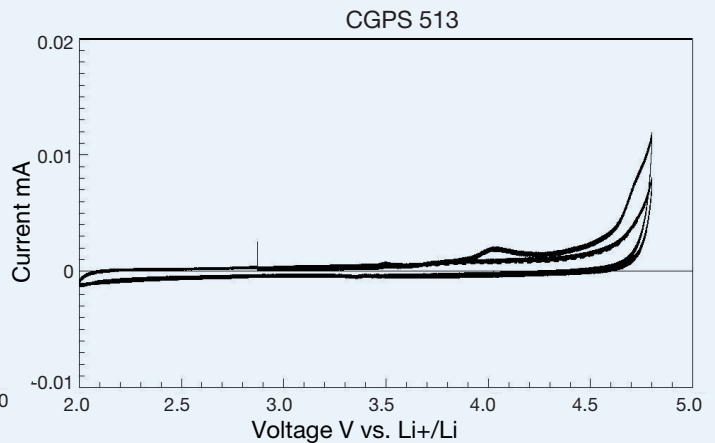
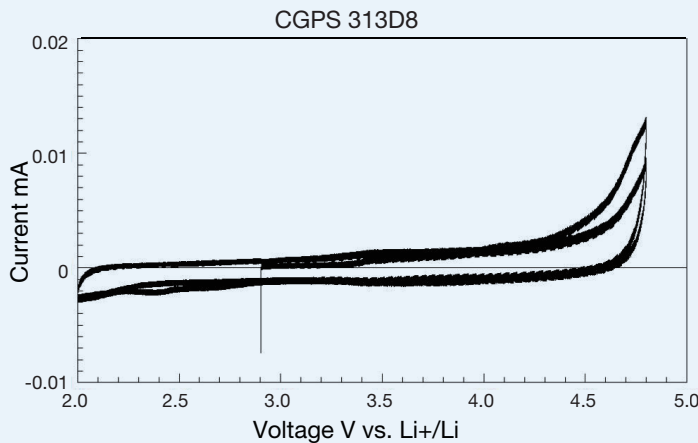
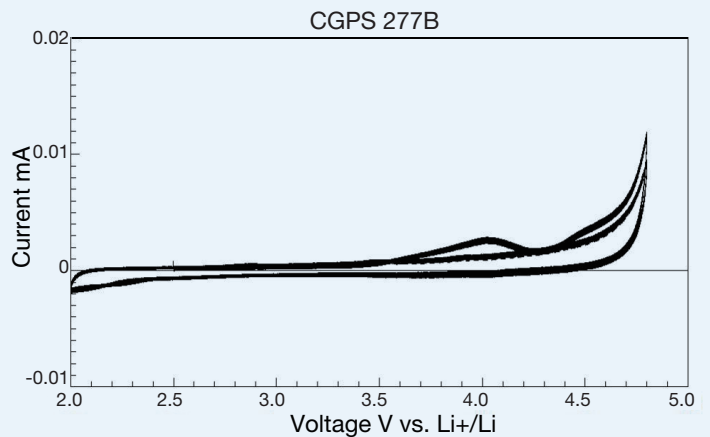
Electrochemical stability beside viscosity reduction is one of the key requirements for dispersing agents. Stability is crucial to guarantee an optimum service time for battery packs. Extensive stability testing of dispersing aid is carried out in BASF laboratory.



Strong oxidation at > 4.35 V for std. dispersing agent



Conclusion: All advanced dispersants offered by BASF additives present better electrochemical stability when compared to the market benchmarks based on polyvinyl pyrrolidone.



Product table

| Dispersing agent | Solid content(%) | Features and benefits |
|------------------|------------------|--|
| CGPS 277B* | 70 | Enhanced viscosity reduction for LFP active materials; best dispersing agent for conductive materials; excellent electrochemical stability |
| CGPS 313D8 | 100 | Enhanced viscosity reduction and wide applicability for LFP active materials of different grades; good electrochemical stability |
| CGPS 513 | 100 | Excellent viscosity reduction and wide applicability for LFP active material of different grades; good electrochemical stability |

*Solvent free version also available



BASF has a comprehensive range of additives, in addition to dispersants, such as wetting agents and defoamers that can be utilized during the production process of battery. Contact us for a dialogue with our technical experts.

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