

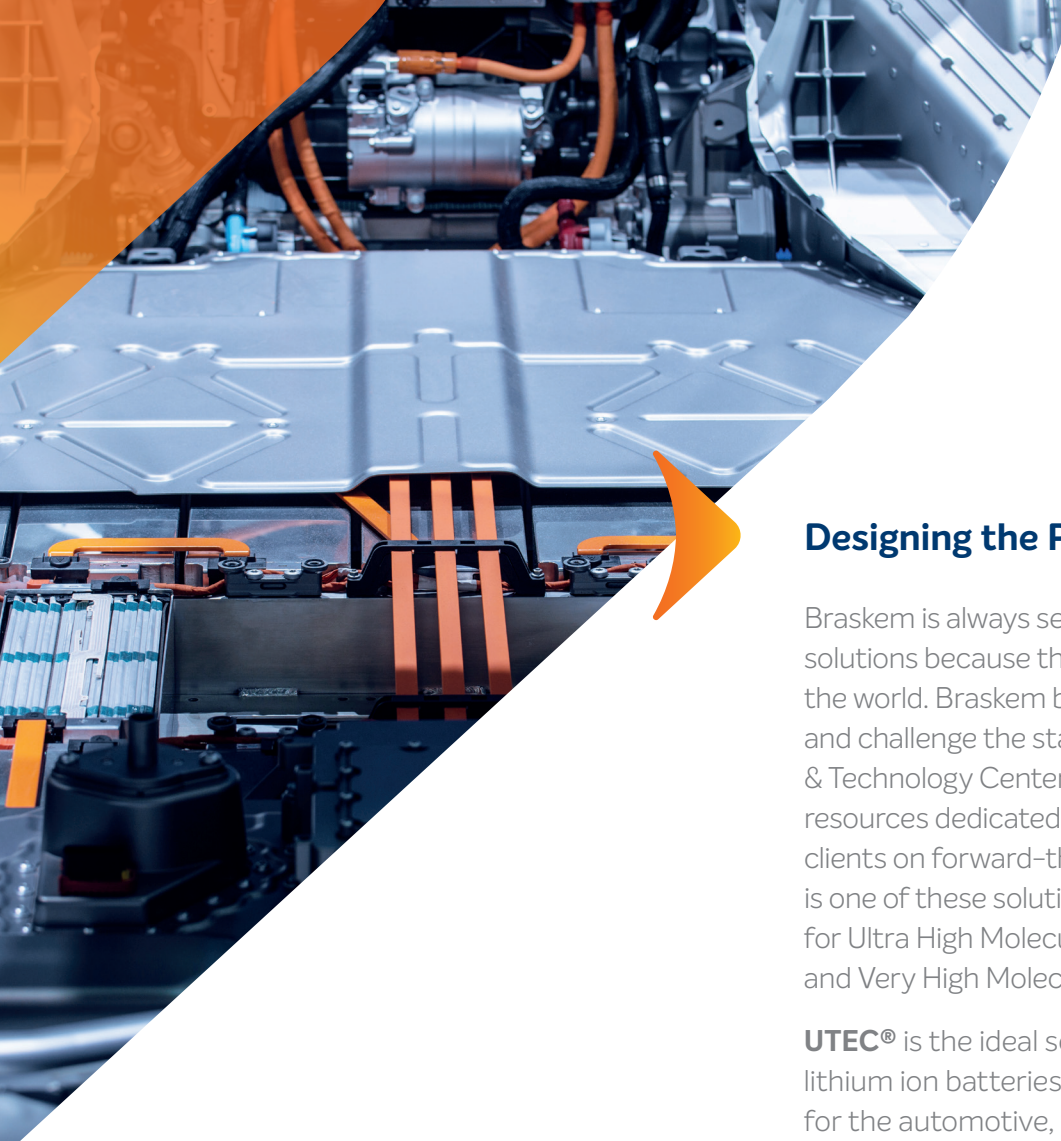


# Electrification Products (UHMWPE and VHMWPE)

**UTEC**<sup>®</sup>

UTEC<sup>®</sup> is a brand by

**Braskem** 

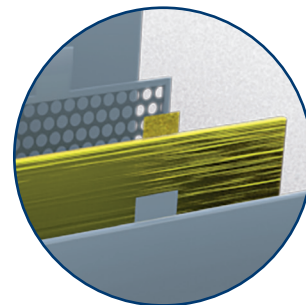
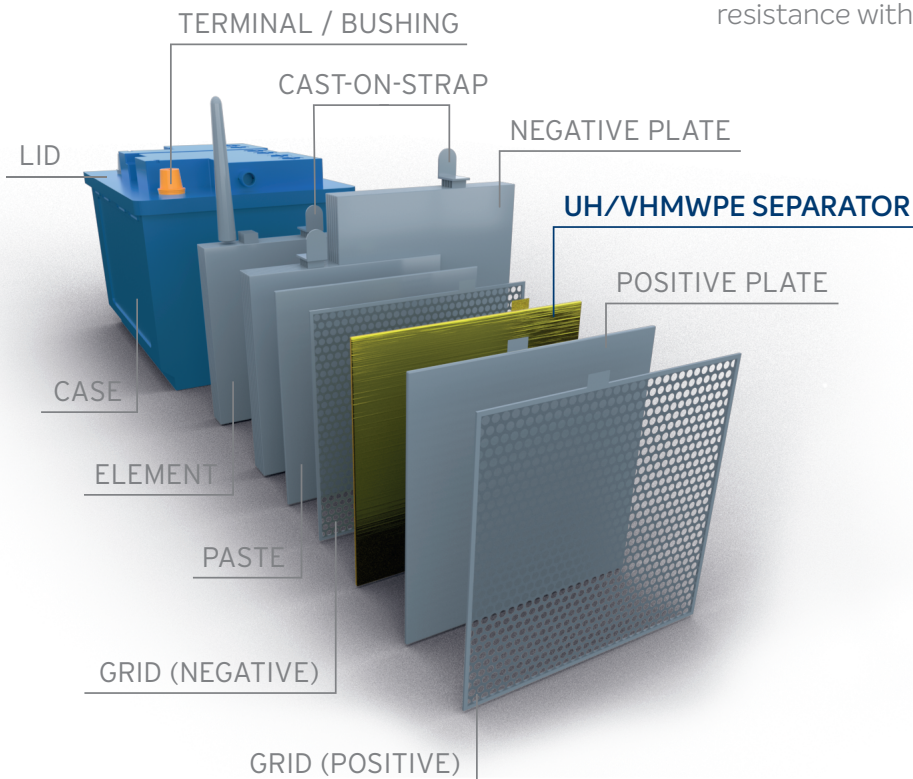


## Designing the Products of Tomorrow

Braskem is always seeking innovative and sustainable solutions because the company knows innovation drives the world. Braskem believes its role is to foster innovation and challenge the status quo. With multiple Innovation & Technology Centers around the world and substantial resources dedicated to innovation, Braskem works with its clients on forward-thinking solutions for the world. **UTEK®** is one of these solutions. **UTEK®** is Braskem's trade name for Ultra High Molecular Weight Polyethylene (UHMWPE) and Very High Molecular Weight Polyethylene (VHMWPE).

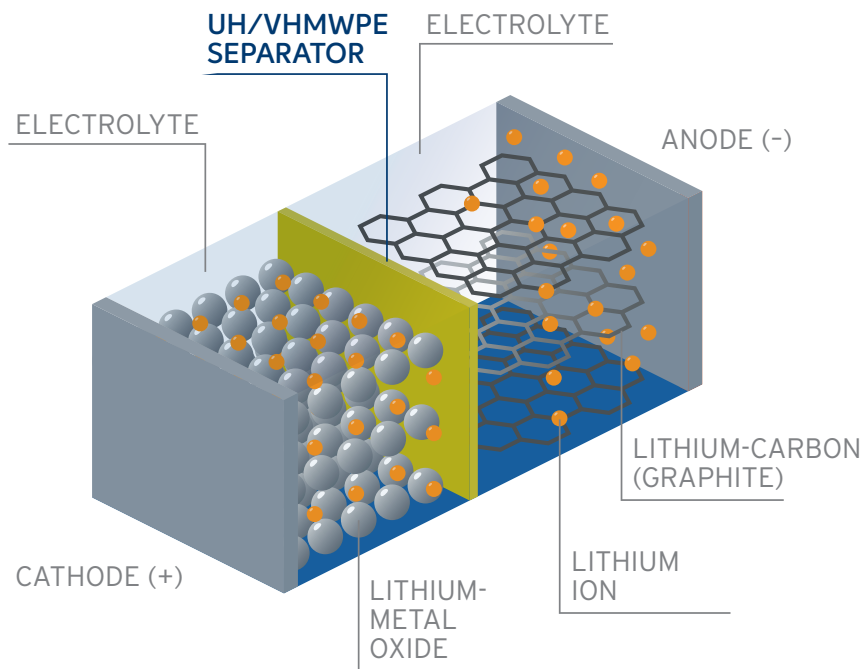
**UTEK®** is the ideal solution for lead acid batteries and lithium ion batteries in a variety of key applications for the automotive, renewable energy storage, and consumer electronics markets. The advantages of **UTEK®** include chemical stability, tensile strength, porosity, puncture strength, dielectric strength and resistance with tight specifications.

## Parts of a Lead Acid Battery



The building blocks of any battery are the cathode and anode. These two electrodes are isolated by a separator. The separator is moistened with electrolyte and allows the movement of ions from cathode to anode on charge and in reverse on discharge. Braskem offers UHMWPE grades that are designed for both wet-based lead acid battery separators and lithium ion battery separators.

## Parts of a Lithium-Ion Battery



### UTE<sup>®</sup> Separator Features:

- Outstanding Mechanical Properties
- Excellent chemical resistance
- Good Solubility for Processing
- High Melt Strength

Demand for thinner battery separators and higher capacities will continue to increase. Higher energy density is needed to support those trends needed in the finished battery market. Whether your application requires separators for lead acid batteries (LABS) or separators for lithium ion batteries (LIBS), Braskem is committed to providing the VH/ UHMWPE technology needed for your application.

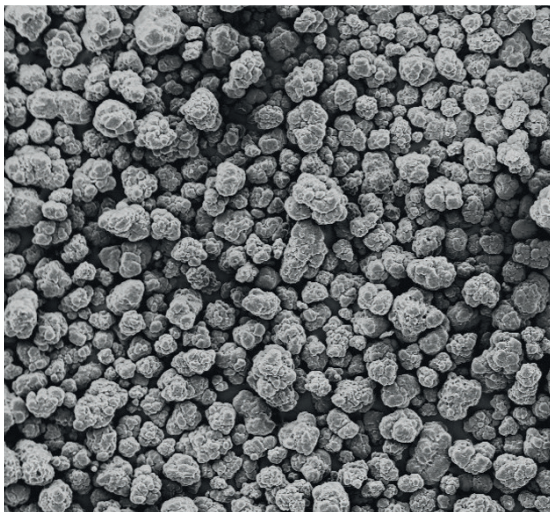
### UTE<sup>®</sup> Quality and Process Control:

- Continuous process monitoring and trending
- Laboratory analysis of in-process samples throughout production
- Laboratory quality certification for each batch

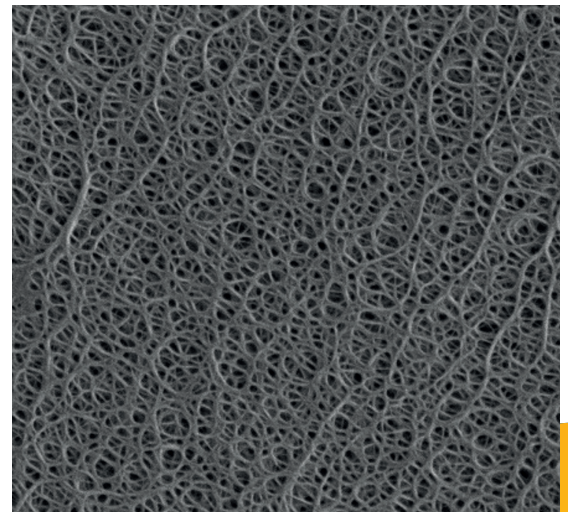
## UTEC®'s High Performance Battery Separator Products at a Glance

Control Properties		Intrinsic Viscosity	Melt Index (190C/21.60 kg)	Molecular Weight	Average Particle Size D50 (Laser)	Particle Size Dp10	Particle Size Dp90	Particle > 250 µm	Particle > 300 µm	Melt Temperature	Density	Bulk Density	Tensile Strength at Break
Method		ASTM D 4020	ASTM D 1238	ASTM or GPC (Margolies)	Laster Light Scattering	Laster Light Scattering	Laster Light Scattering	Laster Light Scattering	Laster Light Scattering	ASTM D3418	ASTM D 792	ASTM D1895	ASTM D 638/ ISO 527
Units		dl/g	g/10 min	10 <sup>6</sup> g/mol	µm	µm	µm	%	%	°C	g/cm <sup>3</sup>	g/cm <sup>3</sup>	MPa
Lead Acid Battery Separator Grades	UTEC5542F	26	No Flow	7.0	120	< 100	< 250	< 4	< 1	133	0.925	0.45	> 30
	UTEC7542F	32	No Flow	9.5	125	< 100	< 250	< 4	< 1	133	0.925	0.45	> 30
Lithium Ion Battery Separator Grades	UTEC142	N/A	1.0	0.4	125	≤ 115	≤ 250	< 5	< 1	136	0.95	0.45	> 30
	UTEC342	N/A	0.5	0.5	125	≤ 115	≤ 250	< 5	< 1	136	0.95	0.45	> 30
	UTEC742	9.0	No Flow	1.5	125	≤ 115	≤ 250	< 5	< 1	136	0.94	0.45	> 30

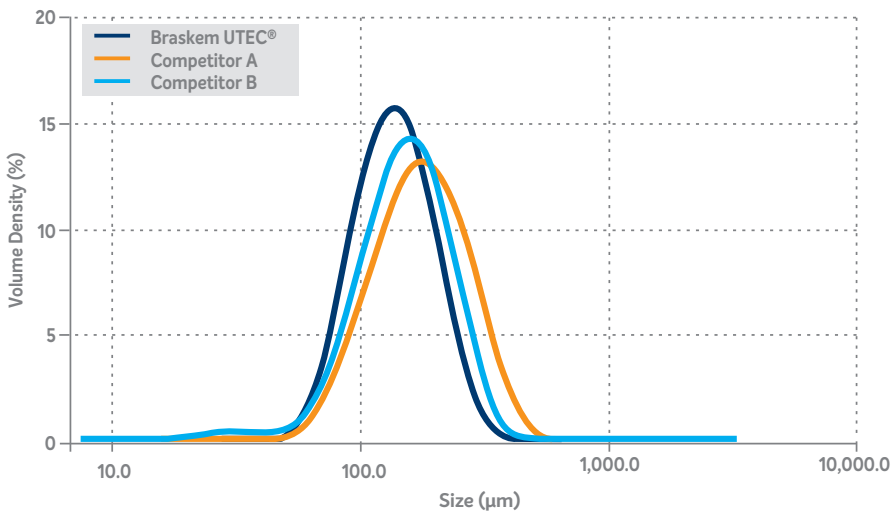
### SEM of UTEC® Battery Separator Powder



### Battery Separator made with UTEC®

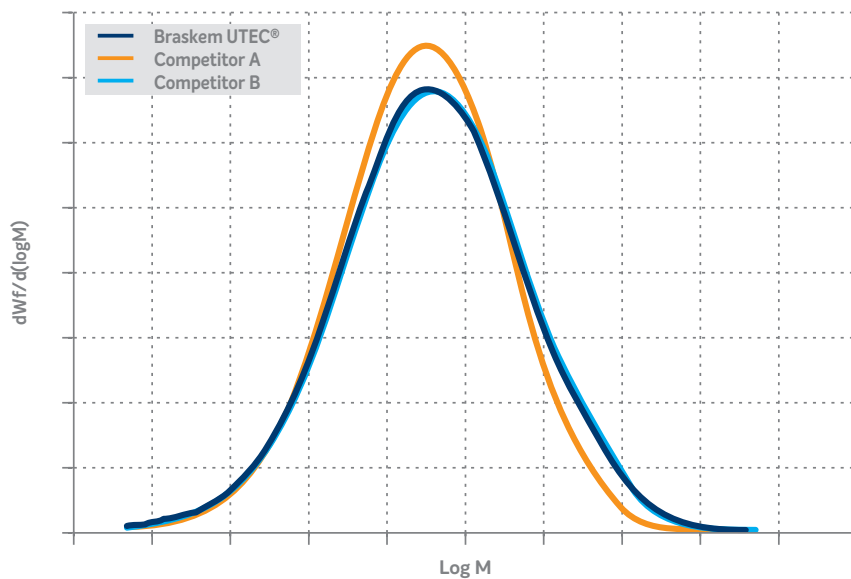


## Light Scattering Results for Braskem UTEC® vs Competitor Products

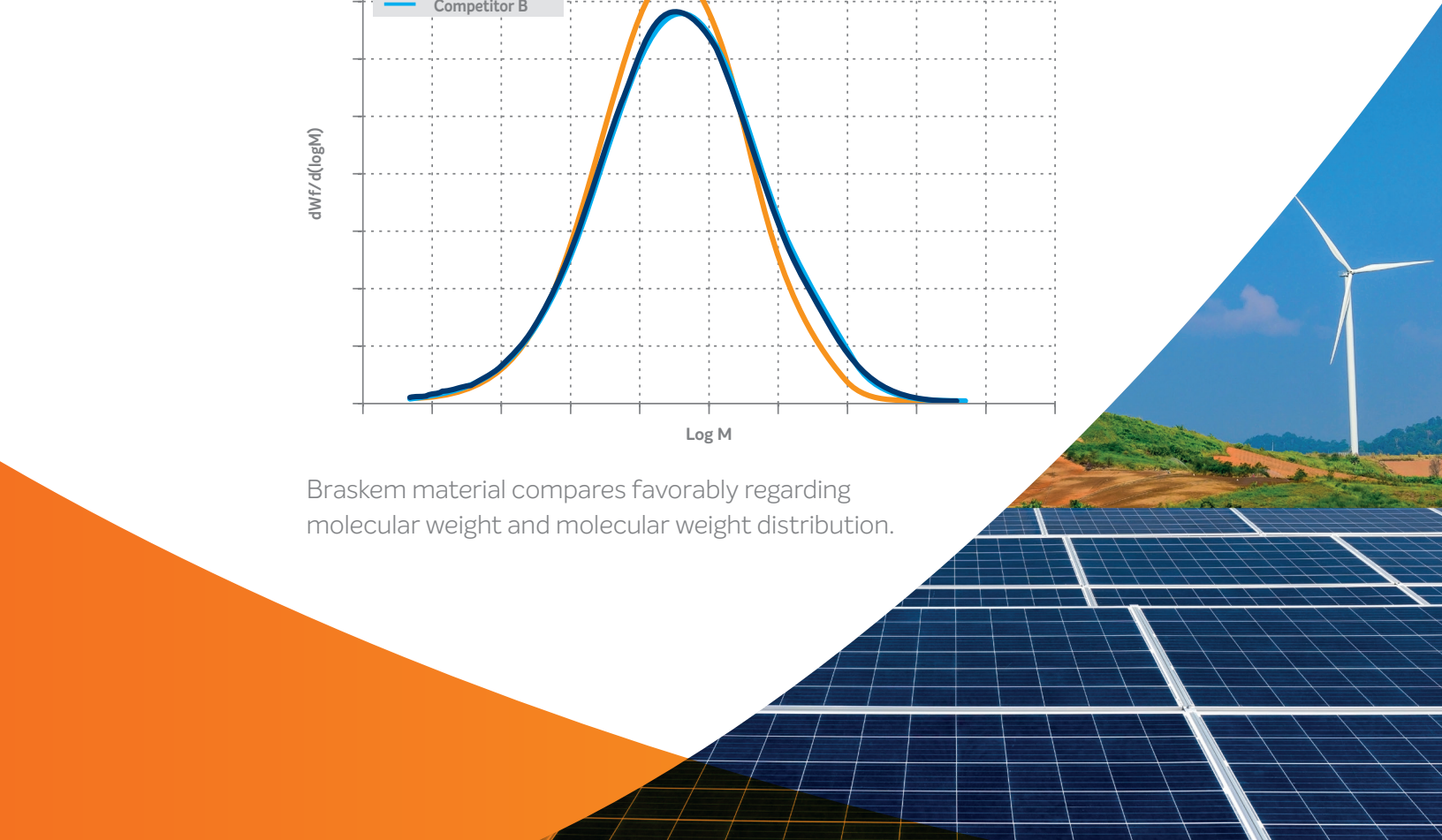


Braskem material has slightly lower average particle size and narrower span versus these competitor products.

## GPC curves for Braskem UTEC® vs Competitor Products



Braskem material compares favorably regarding molecular weight and molecular weight distribution.



With a global vision of the future oriented towards people and sustainability, Braskem is committed to contributing to the value chain for strengthening the Circular Economy. The petrochemical company's almost 8,000 team members dedicate themselves every day to improve people's lives through sustainable chemicals and plastics solutions. Braskem has an innovative DNA and a comprehensive portfolio of plastic resins and chemical products for diverse segments, such as food packaging, construction, manufacturing, automotive, agribusiness, healthcare and hygiene, among others. With 41 industrial units in Brazil, the United States, Mexico and Germany, Braskem exports its products to clients in more than 80 countries.

Braskem America is an indirect wholly owned subsidiary of Braskem S.A. headquartered in Philadelphia. The company is the leading producer of polypropylene in the United States, with six production plants located in Texas, Pennsylvania and West Virginia, an Innovation and Technology Center in Pittsburgh, and operations in Boston focused on leveraging groundbreaking developments in biotechnology and advanced materials.

For more information, visit [www.braskem.com/usa](http://www.braskem.com/usa).

