

***Dura-BMC* in Energy Storage**

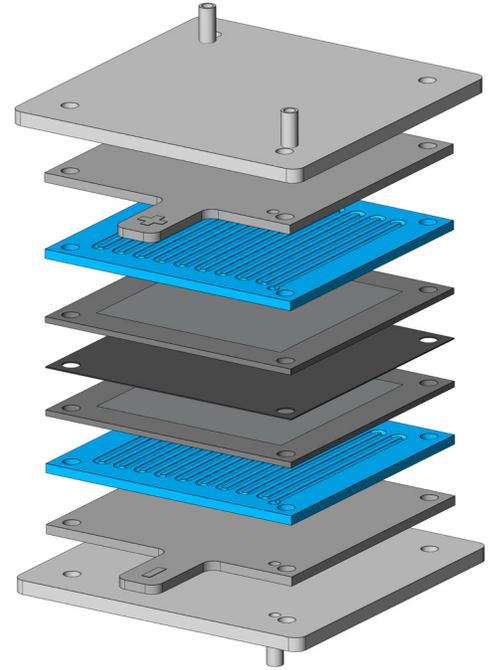
Conductive Bulk Molding Compounds (BMC) for fuel cell and battery applications



Product Information

A bipolar plate is a multi-functional component within a cell stack and is an important element in fuel cell and flow battery technologies.

Bipolar plates uniformly distribute gas and air, conduct electrical current from cell to cell, remove heat from the active area, and prevent leakage of gases and coolant, all while providing mechanical support to the Membrane Electrode Assembly (MEA).



Bipolar Plate Material Considerations

- Corrosion: electro-chemical stability to meet lifetime requirements
- Power Density: minimize thickness while maximizing surface area
- Weight: minimize stack weight (including fluids)
- Application Durability: inertness to other stack components
- Heat Resistance: strength to operate at >100C°

Bipolar Plate Material Comparison

Conductive *Dura-BMC* outperforms competitive materials in key areas while achieving other desired property needs.

Property	✓ Best ✓ Good ✗ Poor		
	Thermoplastics	Conductive <i>Dura-BMC</i> ★	Metallics
Corrosion Resistance	✓	✓	✗
Electrical Conductivity	✓	✓	✓
Mechanical Strength	✗	✓	✓
Mechanical Flexibility	✓	✓	✓
Thermal Conductivity	✗	✓	✓
Formability	✓	✓	✓
Gas Permeability	✓	✓	✓
Specific Gravity	✓	✓	✗
Mass Production	✓	✓	✓
Material Cost	✗	✓	✓
Cost per kW	✗	✓	✗

Actual properties and cost are determined by the cell design, specific composition and manufacturing process for each material

Advantages of Conductive *Dura-BMC*

- Moldable net shape with <1-minute cycles
- Easily machined during development of channel geometry
- Design flexibility - independent flow channel geometry on each side
- Lower plate / bipolar assembly cost
- Excellent corrosion resistance; enabling durability for longer life
- Capable of <2 mm thick bonded two plate assemblies with cooling channels
- Proven success in stationary fuel cells, flow batteries and electrolyzers

Conductive *Dura-BMC* Property Overview

As part of the LyondellBasell *Dura-BMC* portfolio, these conductive solutions are formulated for the unique needs in bipolar plate applications.

Property	Units	<i>Dura-BMC</i> 940-15252A	<i>Dura-BMC</i> 940-13905	<i>Dura-BMC</i> 940-21769
Density	g/cm ³	1.79 – 1.82	1.80 – 1.84	1.87 – 1.90
Flexural Strength	MPa	56	40	29
Compressive Strength	MPa	65	75	35
Glass Transition T _g	°C	196	200	185
Electrical Conductivity Through Plane	s/cm	25	50	25-28
Electrical Conductivity In Plane	s/cm	133	100	72
Product Description		<p>Ideal when maximum power and a minimum stack weight and volume is required</p> <p>Improved material flow and mold fill performance, achieving a thin molding (<1mm thick)</p>	<p>For use in electro-chemical devices capable of generating electricity from oxygen and hydrogen</p> <p>Addresses high conductivity demands, reaching 50 s/cm through plane</p>	<p>Suitable for applications in a highly corrosive environment</p> <p>High chemical resistance to dilute acids</p>
Applications		Transportation	Stationary fuel cells and flow batteries	Stationary fuel cells and flow batteries

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