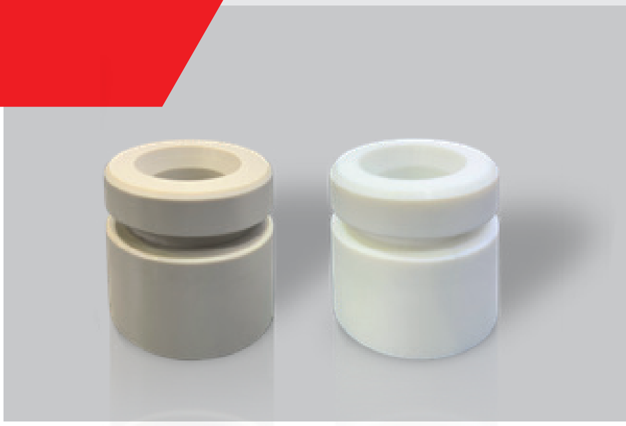
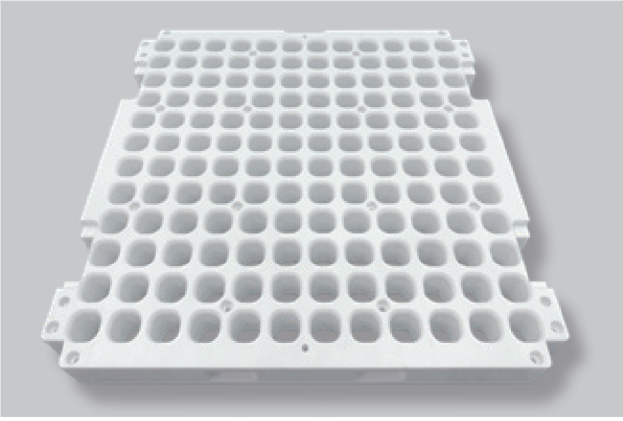
MITSUBISHI CHEMICAL
ADVANCED MATERIALS

Battery Cell Production –

Electrolyte Filling Systems: Filling Jigs in Cell Assembly Stage





Challenge

Rechargeable ("secondary") batteries are a major enabler to electrify our society. Out of all rechargeable batteries, Lithium-ion Batteries ("LIB") dominate the landscape due to their high energy density.

The LIB cell production process can be split in 4 major phases:

Key Requirements

- Chemical resistance against spills of electrolyte: 1.0M $LiPF_6$ in EC/EMC
- Dimensional stability – allowing precise positioning of dosing needles
- Wear resistance – maintaining original dimensions after heavy use
- Pollution safety – absence of metal or carbon fibers
- Fire safety – low flammability (preferably UL94 V-0)

Electrode Formation

Anode and cathode are produced as thin foils by a roll-to-roll process.

Cell assembly

All components assemble to create the cell.

Cell Formation & Sealing

Cell ageing process; first electrical cell charge to grow initial protective layer.

Cell Testing

Testing by discharge & recharge cycles.

During the assembly phase, the anode, separator, cathode and another separator are stacked/wound into a jelly roll. This roll is inserted in casing to create the cell, which is then filled with electrolyte.

As the electrolyte is highly reactive and chemically aggressive, the battery manufacturing equipment, such as dosing systems and filling jigs, needs to be chemically resistant.
In close cooperation with experts within Mitsubishi Chemical the MCAM materials were tested against a standard type of electrolyte (please see backside of this flyer).

Our Recommendation

- Ertalyte® PET-P Natural
- Ertalyte® SLP PET-P Blue
- Ertalyte® TX PET-P Light Grey
- Ketron® 1000 PEEK Natural (brownish-grey)

Customer benefits

- Shortened development time, due to pre-qualification on chemical resistance to electrolyte
- Stable and long lasting performance during lifetime, due to low stress products and extreme wear resistance.

Functional Test: Retention of properties after chemical exposure to electrolyte.

Retention of Tensile Strength and Tensile Strain at Break as a function of the hours of exposure (100% = no change) to 1.0M LiPF6 in EC/EMC at room temperature							
		Tensile Strength			Tensile Strain at Break		
Material	Price range	0hrs	8hrs	72hrs	0hrs	8hrs	72hrs
Nylatron® MC907 PA6 Ertalon® 6PLA PA6	$	100 %	97 %	95 %	100 %	79 %	85 %
Ertacetal® C POM-C Acetron® GP POM-C	$	100 %	99 %	95 %	100 %	67 %	29 %
Ertalyte® PET-P	$	100 %	100 %	100 %	100 %	135 %	117 %
TIVAR® H.O.T. UHMW-PE	$	100 %	99 %	99 %	100 %	NT	104 %
Techtron® HPV PPS	$$$	100 %	99 %	98 %	100 %	NT	96 %
Ketron® 1000 PEEK	$$$$	100 %	99 %	99 %	100 %	NT	114 %
NT = Not Tested		best	2nd best	3rd best	average	2nd worst	worst

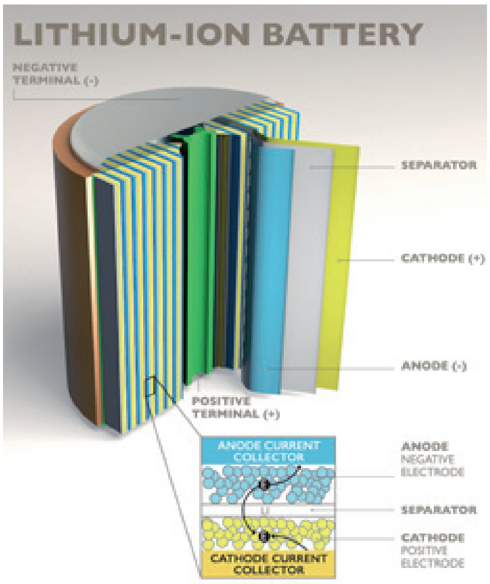
Test conclusions

Tensile strength is not much affected by the electrolyte. Elongation at break is considered as most relevant test criteria, to judge possible embrittlement by chemical attack. Materials that show degradation include:

- Nylatron® MC907 / Ertalon® 6PLA PA6
- Ertacetal® C / Acetron® GP POM-C

Materials that showed no, or little degradation are:
- Ketron® PEEK
- Techtron® HPV PPS
- TIVAR® H.O.T. UHMW-PE
- Ertalyte® PET-P (best overall performance)

As Ketron® PEEK and Techtron® HPV PPS are high temperature materials, they offer additional resistance to hot oven removal of remaining electrolyte, and also offer UL94 V0 flammability rating.



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