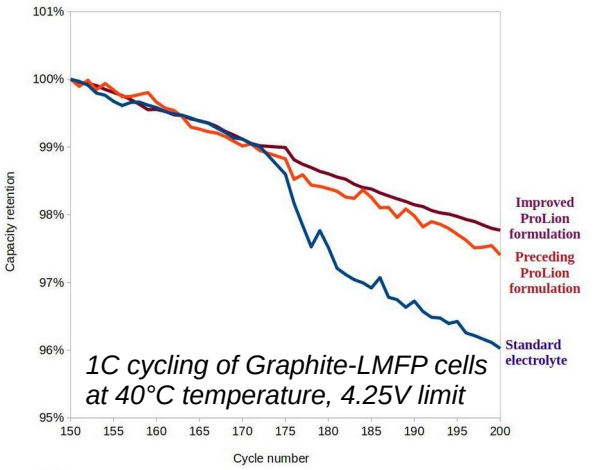
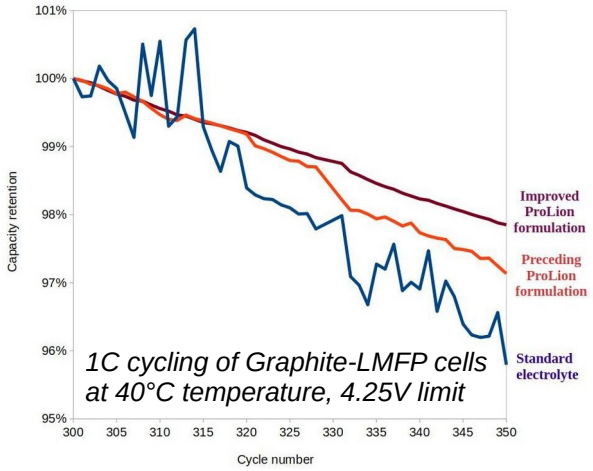
Improved ProLion™ electrolytes for Li-ion batteries' elevated temperature use, fast charging, and extended service life

The electrolyte formulation is a main determining factor of Li-ion batteries' cycle life, calendar life, and re-charging rate. With a rapidly expanding global production of Li-ion batteries, the chosen electrolyte formulation determines the fading rate of EV's range, the recharging speed of EVs, the service life of grid energy storage installations, and the needed scale of battery recycling infrastructure.

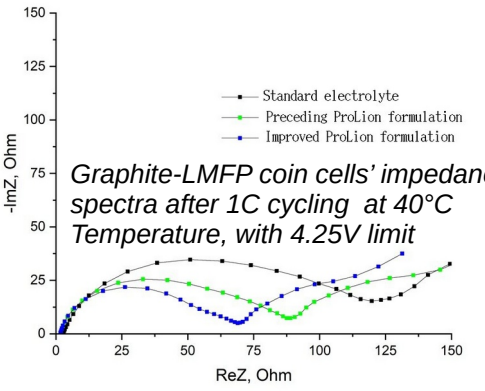
However, at room temperature testing, the distinction between mediocre and high-performing electrolytes may show up only after more than a thousand cycles. Elevated temperature testing allows a fast identification of a high-performing electrolyte, and informs the battery's temperature tolerance. For this reason, we undertook +40°C electrolyte testing on Graphite-LMFP battery chemistry, which is widely anticipated to become the next-generation mainstream chemistry for Li-ion. As the data charts show, we recently obtained further improvements in capacity retention and fast-charging support. Smaller impedance semi-circles translate to faster re-charging capability. The baseline "standard" electrolyte contains 2% vinylene-carbonate additive.





BroadBit Batteries' ProLion™ electrolyte formulations bring the following improvements over currently existing commercial electrolytes:

- **Faster battery charging**: electric vehicle (EV) manufacturers are competing to reach faster and faster re-charging. ProLion™ remains stable up to 4.4V – which allows larger charging over-potential than traditional 4.2V-limited electrolytes. This allows 30%-50% faster charging of LMFP battery cells.
- **Longer cycle life**: electric utilities are seeking longest battery cycle life, in order to reach lowest €/kWh/cycle. Our electrolytes significantly improve cycle life for LFP, LMFP, NMC, and LCO. At last, LMFP cathodes become commercially viable with ProLion™ electrolyte.



- **Higher battery capacity**: EV manufacturers are competing to provide longer EV range. ProLion™ remains stable up to 4.4V – which allows +10% higher NMC batter capacity than traditional 4.2V-limited electrolytes.
- **Higher operating temperature**: electric utilities and EV manufacturers would prefer to operate batteries without cooling. ProLion™ supports up to 40°C during fast charging, while still retaining a long battery cycle life.

The planned electrolyte production is future-proof with respect to Na-ion transition: the Na-salt analogues of same electrolyte formulations shall be produced upon market demand.