

POROCARB® IMPROVES THE HEAT DISSIPATION AND PROLONGS LIFE TIME OF BATTERIES



Challenges

Heat dissipation is playing an important role in the operation of high power LIB cells. During high current discharge, cells often heat to cutoff temperature before being fully discharged, resulting in **reduced capacity** delivered to the devices. This directly **impacts user experience** with devices powered by those cells, **limiting operating times** of cordless home appliances, power tools and drones. In some cases, drone even crashes when it is cut off from the power supply in flight.

In addition, strong heat up of cells increases the rate of harmful side reactions that amplify rapid cell degradation. Electrolyte decomposition and consumption of electrolyte additives are major factors that reduce cycle life, increases gas formation and cell swelling, which have huge negative impact on lifetime and safety.

Solutions

Heraeus Porocarb® is an innovative hard carbon additive to boost electrode performance and reduce cell temperature for high current discharge

Porocarb is highly thermally conductive and offers two advantages. First, the large and close contact surface area with the active material provides ideal conditions to **transport heat away** from the active material. Second, the open well-connected network of macropores **improve Li⁺ transport**, leading to a better spatial homogeneity of electrochemical reaction, while ensuring a large contact surface with the liquid electrolyte. This liquid-solid interface **enables convective flows**, transferring heat from the solid to the liquid phase.

This gives Porocarb properties of a heat exchanger inside the electrode, and enables efficient heat transport away from the active material (heat source) via the electrolyte to the current collectors (heat sinks) of both electrodes (Fig. 1A). Cycle life will be prolonged both by reduced cell temperature and by more a **homogeneous electrochemical reaction** (Fig. 1B).

Table 1. LFP cathode formulation for a 3.3 Ah pouch cell (Energy density: 145 wh/kg, Loading: 120g/m², Density: 2.3 g/cc).

wt.% split	CB	CNT	Porocarb	LFP	PVDF
Reference	2.5	1.0	-	93.5	3
Porocarb	0.5	1.0	2.0	93.5	3

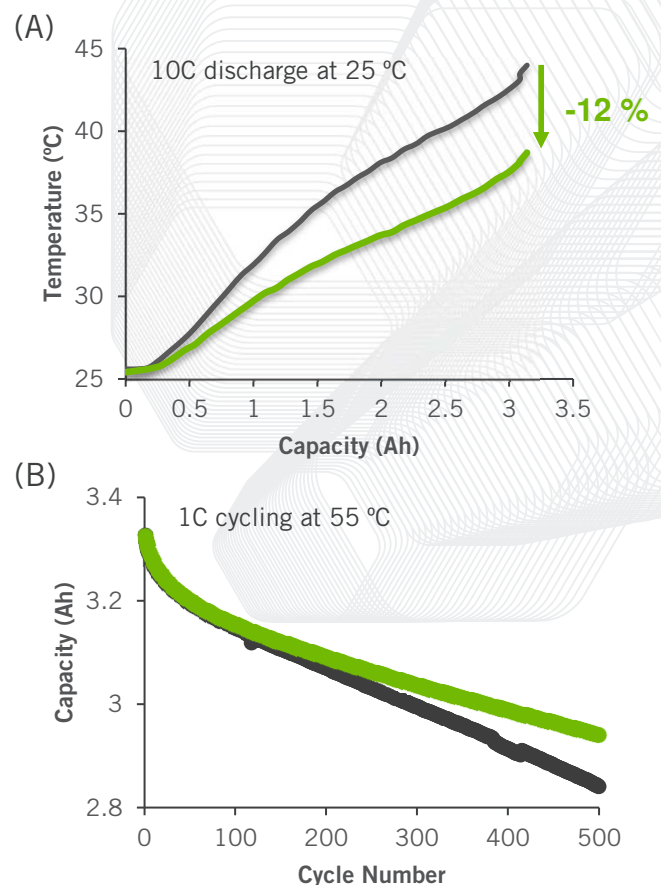


Fig. 1 (A) cell self-heating temperature with 10C discharge at 25°C; (B) Cycle performance with 1C at 55°C



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