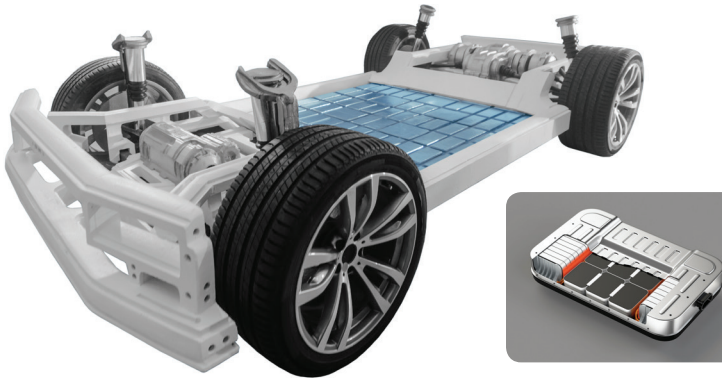


Liquid Electrolytes in Electric Vehicle (EV) Battery Production



CASE STUDY

PIABEVBA1EN



Background

Global sales of electric cars accelerated quickly in 2020, rising by 43% to more than 3 million units whereas the overall car industry declined by 20%. The rise in electric car sales is being driven by government policies to reduce carbon emissions and two additional factors:

- Electric cars continue to improve their technical performance in terms of autonomy
- There are more and more private and public recharging facilities in urban and rural areas

Market analysts predict that EV sales will pass the 12 million mark in 2025 and rise to 21 million in 2030 demonstrating a clear acceleration of the market demand for this innovative technology.

The continuous progress of EV battery technology continues to be the main driver of the market demand for the electric vehicles.

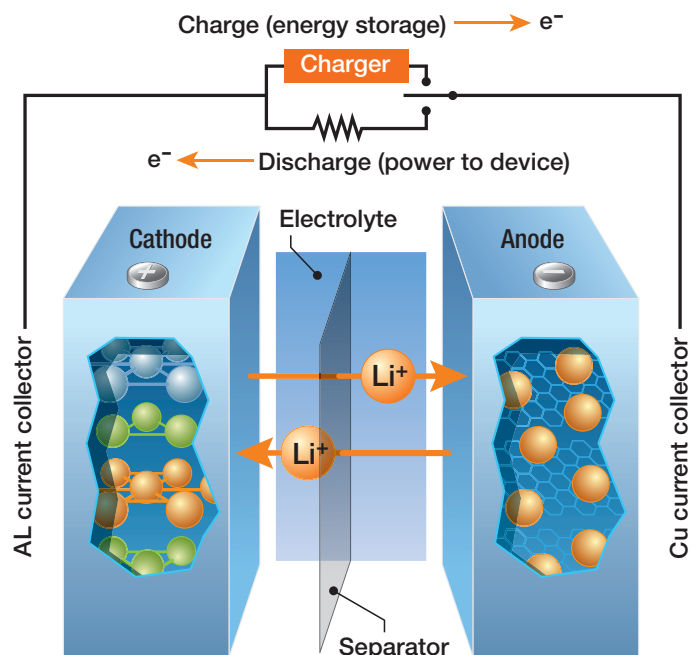
Undoubtedly, it is lithium-ion batteries that have most contributed to the advanced development of the EV sector in recent years. These are the best batteries if we consider three parameters: optimization of the size and weight of the battery, the ratio of mass to the amount of stored energy and a favorable price.

Problem

The smallest and most important component of the lithium-ion batteries that power EVs is the electrochemical cell. The electrochemical cell consists of a cathode and an anode which are separated physically but connected electrically by an electrolyte solution. A battery's discharge results from the diffusion of lithium ions from the anode to the cathode through the electrolyte, as shown in the diagram on the right.

To maximize the performance of the electrolyte, i.e. high ionic conductivity and high chemical and electrochemical stability solid particle content must be minimized. To achieve this, the liquid electrolyte must be filtered before the filling phase. This serves to prevent premature functional degradation over time, especially the charge and discharge rates.

A major chemical company wanted to upgrade its filter solutions to meet the cleanliness specification of the liquid electrolyte required by the EV battery manufacturer.



Lithium-ion battery charge/discharge diagram

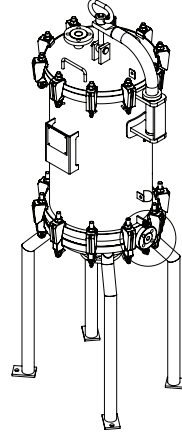
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Problem

The main technical challenge was the chemical nature of the electrolyte itself: a very high degree of acidity requiring specific coating materials to protect the filter vessels.

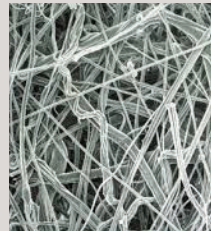
The single or multi-element stainless steel filter vessels had to be PTFE-coated to avoid premature ageing and mechanical damage. The cleanliness levels targeted for this high purity process application required very fine particulate removal ratings (from 0.45µm to 2µm). Depending on the location of the filters in the production process (bulk filtration, point of use filtration, intermediate or final products, etc.), different filtration technologies were used to minimize the total cost of ownership.



ETFE-coated multi-element vessels
(up to 19 elements)



Poly-fine® II & Varafine™ VRTR series



Nexis® T filter medium

Conclusion

With the Pall filter solutions installed on the liquid electrolyte production line, the chemical company was able to supply a super clean finished product to its customer.

The cleanliness level achieved on the electrolyte at the point of use enabled the EV to avoid premature ageing or functional damage of the batteries due to built-in solid contamination.



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