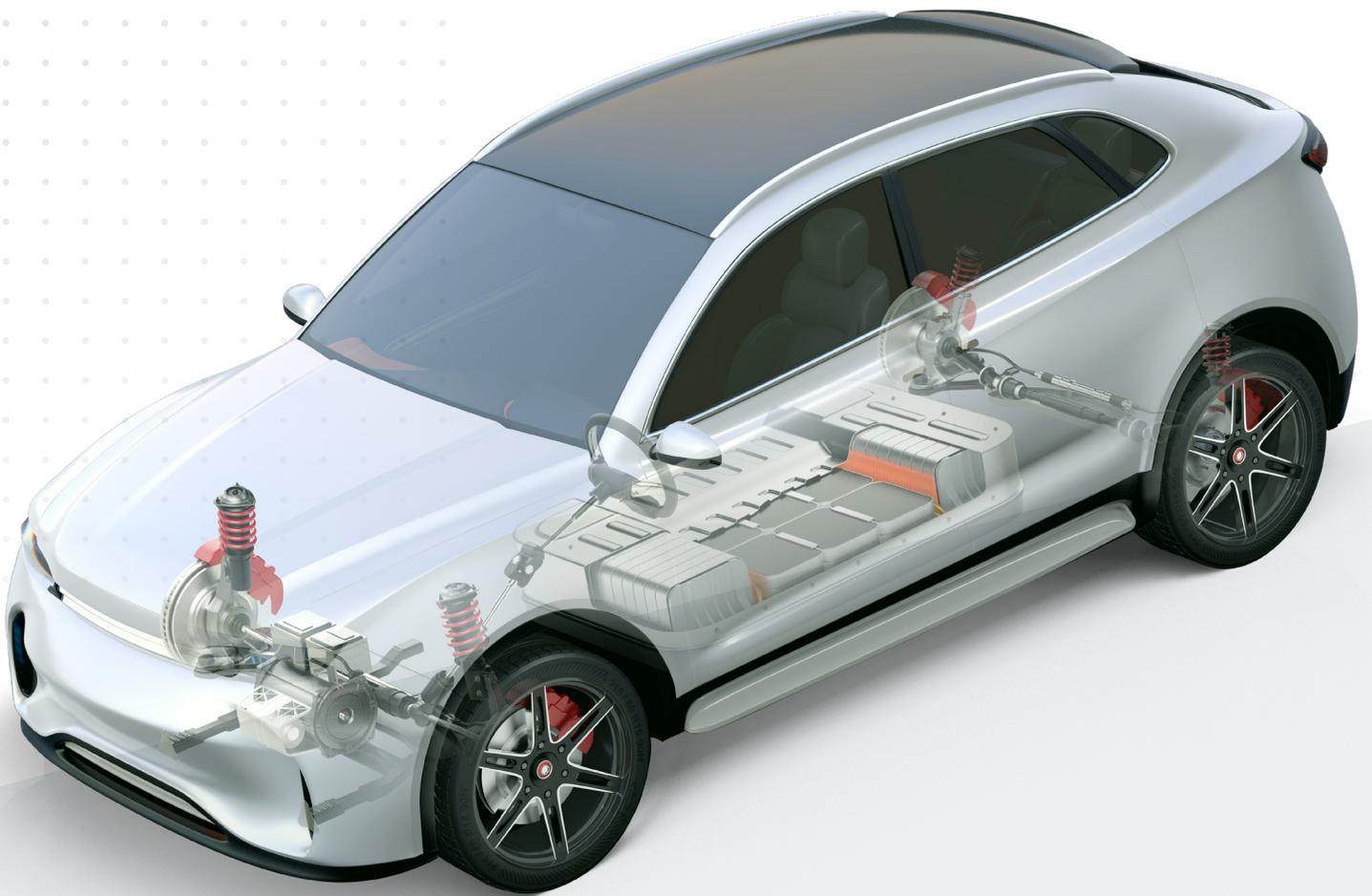


COORSTEK®



ELECTRIC VEHICLE
APPLICATIONS

ADVANCING ELECTRIC VEHICLE TECHNOLOGIES WITH TECHNICAL CERAMICS

Technical ceramics extend system life, improve range, and increase safety—reshaping the possible in battery electric vehicle (BEV), hybrid electric vehicle (HEV), and fuel cell vehicle (FCV) systems.

CoorsTek technical ceramics provide necessary material properties such as high thermal conductivity and dielectric strength to help ensure safe and efficient operation. CoorsTek aluminum oxide (alumina) and aluminum nitride help reduce operating temperatures and provide electrical isolation for electrified powertrain components such as battery modules and high-voltage distribution systems.

BATTERY MODULES

Depending on the electric vehicle system, hundreds or thousands of individual battery cells are required to generate the power necessary for vehicle operation. In order to protect these cells from elements such as outside temperatures, vibrations, and debris, cells are grouped together within frames to create a battery module. In turn, multiple modules are assembled—along with equipment such as battery management and cooling systems—into the single battery pack that powers the electric vehicle.

High-temperature and chemically inert ceramics provide cell-to-cell, module-to-module, and pack-level protection. The high dielectric strength of alumina and aluminum nitride means that they are all-star electrical insulators. This is a key property for components included in electrified powertrain battery modules, where electrical isolation is vital.

In addition, the high thermal conductivity of these technical ceramics helps enable the battery modules to dissipate heat efficiently and effectively. Technical ceramics can also be combined with endothermic materials to enhance heat absorption.



VERTICAL CAPABILITIES ENSURE HIGH-QUALITY END PRODUCTS

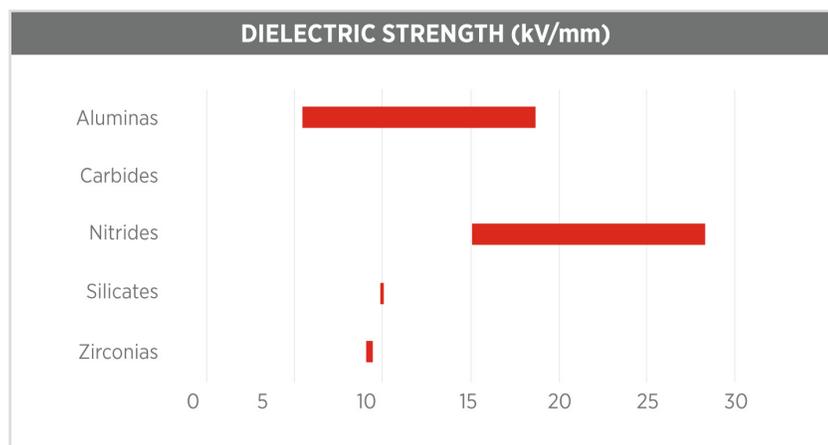
CoorsTek produces its own alumina and aluminum nitride powders used to manufacture components for electrified powertrains to ensure a consistent supply of top-quality raw materials. Each step of the production process is tightly controlled. Powders are produced to meet strict specifications, and finished components can be manufactured to all shapes and sizes via numerous process capabilities such as dry pressing or injection molding.

CoorsTek automotive facilities are certified to IATF 16949:2016 standards.



HIGH-VOLTAGE DISTRIBUTION SYSTEMS

An electrified powertrain's battery cells store the electricity required to power the vehicle, but many additional components are needed to distribute that electricity in order for the vehicle to operate. From charge inlets to high-voltage busbars and relays, the dielectric strength and desired thermal properties of technical ceramics help ensure the optimal performance of these elements.



Technical ceramics provide the same benefits for high-voltage connectors as for components such as DC/DC converters, DC/AC inverters, on-board charging modules, charge inlets, and battery modules. With excellent dielectric strength, alumina components provide excellent heat dissipation while also providing protection from corrosion.

The power distribution box is responsible for distributing power as necessary to all of the components operating in a battery electric, hybrid electric, or fuel cell electric vehicle system. Alumina components provide heat dissipation to help ensure electrical isolation between the box's high-current busbars and metal components. These components can also transmit heat from busbars to cooling plates inside the distribution box—reducing operating temperatures at the busbar connections.

PREFERRED ALTERNATIVE TO METALS AND PLASTICS

Technical ceramics are advancing the capabilities of electrified powertrains by replacing metals and plastics. Alumina and aluminum nitride both feature superior dielectric properties, while providing excellent thermal conductivity in electric vehicle systems. The combination of thermal conductivity and superior dielectric strength enable the technical ceramics to better control and dissipate heat in high temperature systems where metals and plastics breakdown.

In addition, alumina and aluminum nitride components are non-corrosive and much lighter than steel and aluminum. Corrosion resistance helps ensure durability and long life, while the lightweighting benefit improves the battery modules' efficiencies to address consumer concerns regarding the driving range of BEVs.

PARTNER WITH COORSTEK

Our customer focus is the reason we have become the world's leading manufacturer of technical ceramics. To learn more about CoorsTek and our automotive capabilities, contact us:

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- R&D Hub and Manufacturing Facility
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