Where electricity and cars meet: High-voltage plug-in connectors in electric and hybrid vehicles

Case Study

BASF is expanding its range of engineering plastics for the dynamic market of electric and hybrid vehicles. Tailor-made Ultramid® and Ultradur® materials are now available globally for equipping vehicle-interior and -exterior high-voltage plug-in connectors with precisely fitting characteristics. The special polyamide and polybutylene terephthalate grades meet the demands on flame retardancy, color stability, mechanics, and electrical isolation. They therefore allow automotive manufacturers to save on weight and installation space around the battery and at the same time help to improve safety in e-mobility.
One example is the connectors for hybrid and electric vehicles which TE Connectivity, Schaffhausen (Switzerland) has developed from various Ultramid® grades for numerous automotive companies in close collaboration with BASF. The high-voltage connectors can be identified by their typical orange color (color batch from BASF Color Solutions). The light-colorable BASF polyamide used is color stable and resistant to thermal aging. Particularly in the sensitive range of high voltages the color coding of the individual components is safety-relevant: It needs to remain highly visible for at least ten years. BASF optimized the connector locks using its simulation tool Ultrasim®.

The globally available Ultramid® and Ultradur® grades pass the test according to the tighter IEC standard 62196-1 and the glow wire test according to IEC 60695-2-11 -at 850°C for parts made from isolating matter which holds conducting parts, and at 650°C for all other parts made from isolating matter. The materials for plug-in connectors close to the battery are resistant to high temperatures as well as coolants and equipped with flame retardant if necessary. They make for low-warpage, tight and creep-resistant parts.

The materials used for plug-in connectors in the charging system are noted among other things for their flame retardance, impact strength and creep resistance as well as excellent isolation properties.