

# ADVANCED PLASTICS & POLYMER COMPOSITES

Advanced plastics and polymer composites offer an unparalleled combination of properties that are essential to achieving the opportunities outlined in the ACCESS framework. As automakers rapidly invent mobility solutions suited to an autonomous, connected, electrified, and environmentally responsible automotive future, advanced plastics and polymer composites are the materials they can rely on to push the boundaries of their designs and wow consumers.

The advanced plastics and polymer composites industry is hard at work developing and rethinking materials and ways of creating them that can make automakers' even most radical ideas a reality sooner rather than later. The examples that follow are just a few of the ways these materials can already help the automotive industry capture the opportunities in the ACCESS framework and shape the personal mobility revolution.

## > Safely add sensors, electronics, and batteries to vehicles



Provide signal transparency required for active safety systems and sensors including radar, Light Detection and Ranging (LIDAR), and acoustics

Protect sensors, electronics, and batteries from transmission interference, noise, vibration, harshness, elevated temperatures, impact shock, and other hazards



Interactive display screen

Prevent marring and prolong life of interactive display screens

Protect occupants from fire hazards (flame-retardant adhesives, fabrics, and battery pack assemblies)



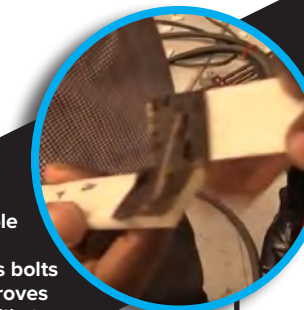
Carbon fiber frame with honeycomb impact panels

## > Offset added weight from additional features



Plastic battery assembly

Reversible bonding (replaces bolts and improves repairability)



Provide high strength-to-weight ratio to offset added weight increases and improve vehicle efficiencies

**Fast fact:** Using carbon fiber reinforced polymer composites for mixed-material designs could reduce the weight of some automotive components by 50-75%<sup>15</sup>

## ➤ Enable design and seamless integration of high-value electronic content



Additively printed control button

Enable signal transparency for outgoing sensors, **signal reflectivity** to facilitate detection of other vehicles and infrastructure, **robust performance** in harsh vehicle operating conditions, and **design freedom** to consider styling, form, and function



Plastic grille with hidden sensors

Allow manufacture of grilles and front fascia to meet styling design requirements while allowing hidden sensors to properly transmit radio frequency transmissions from vehicle to vehicle

Enable design of emerging vehicle electronics including transparent displays, touch-sensitive switches, ambient lighting aesthetics, and voice-enabled internet of things (IoT) devices

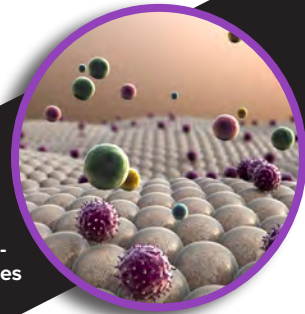
## ➤ Support a reimagination of vehicle interiors



Seating concept

Enable more modular and multi-configurable interior components for autonomous vehicles such as reversible seats, desks, tables, or entertainment consoles for more dynamic and customizable commuting modes

Materials with anti-odor and anti-microbial properties



Provide options for more equitable and inclusive vehicle interiors that expand transportation access for elderly and disabled passengers

Improve ability of interiors to stand up to the wear and tear of use as a shared vehicle (e.g., scratch-resistant materials to protect expensive displays and touchscreens; high-durability components that are easy to repair, replace, refurbish, and recycle; and hygienic materials with self-cleaning, anti-odor, and anti-microbial properties for improved passenger experience and comfort)

## ➤ Help modernize transportation infrastructure



Plastic infrastructure components that can enable connectivity

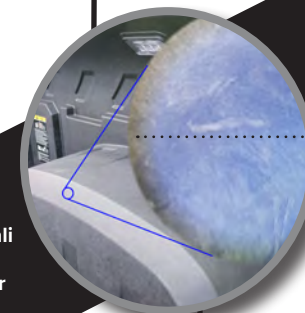
Enable durable infrastructure that can communicate with vehicles to maintain safety and traffic flow (e.g., plastic vehicle charging stations, traffic flow monitors, stoplight timers, lane-diversion signals, temporary barriers, travel direction signs, and emergency vehicles)<sup>16</sup>



Plastic network vehicle charging stations

Design for disassembly, repair, and replacement to extend useful product lifetimes, and **efficient recycling and re-insertion of materials** back into new vehicles and other useful applications

## ➤ Promote sustainable design and supply chain



2019 GMC Sierra Denali lightweight carbon fiber composite truck bed

Includes pocket reinforcements made from recycled carbon fiber thermoplastic materials<sup>17</sup>

Advances in polymer recycling technologies, multi-material joining methods, end-of-life vehicle dismantling and recovery approaches, and comprehensive lifecycle assessment (LCA) tools with high-quality data are allowing plastics to transition toward a more circular economy

**Fast fact:** A study recently conducted by ACC's Economics & Statistics Department found that investing in new chemical recycling facilities and operations could produce \$9.9 billion in economic output and could generate more than 38,000 jobs in local communities across the country.<sup>18</sup>