Battery solutions
EMI shielding (EMS)

Protection of sensitive components

Today's driving comfort and vehicle safety heavily depend on the increasing number of sensors, actuators, and other electronic systems. As the complexity of all these electronic systems increases, modern cars are vulnerable to electromagnetic interference (EMI). To ensure that electromagnetic radiation does not impact the desired functionality of these systems, they must be protected accordingly, especially in electric vehicles, where the electric motor, battery, inverter, and converter are sources of electromagnetic interference (EMI).

EMS (electromagnetic shielding) preventing interferences over a wide frequency range

EMI shielding isolates electronic systems and components, minimizes crosstalk, and reduces EMI susceptibility without impacting system performance. Electromagnetic shielding (EMS) reduces the electromagnetic field in a room by blocking it with barriers made of conductive or magnetic materials.

Various standards for electromagnetic compatibility (EMC) were defined on global, national, or regional levels, and by the vehicle manufacturers themselves, who define their own standards for their vehicles and their subassemblies installed. Typical shielding targets are found in the range of 40 dB to 70 dB i.e., shielding of 50 dB over the frequency range reaching from 150 kHz to 100 MHz.

The first choice against high-frequency electromagnetic fields caused by eddy currents are highly conductive metals that are widely used in electromagnetic shielding applications. Shielding against low-frequency electromagnetic fields is best fulfilled by magnetic metals that can channel magnetic fluxes.

Electroplated multi-layer metal coatings combining both, conductive and magnetic layers, provide the best shielding results in the frequency range from kHz to GHz.

Engineering plastics – the future battery housing material

Weight and cost play important roles in the material selection for battery packs and other electronic systems enclosures. Today, a new trend arises to replace steel or aluminum as the preferred material with engineering plastics and dielectrics that provide significant weight and cost advantages. As engineered plastics and dielectrics are not conductive, they do not shield electromagnetic fields. Adding metal flakes to the plastic matrix does not improve shielding efficiency, and adding an additional metal foil while casting the enclosure will eliminate the cost advantage.

Keeping the cost and weight benefits of the engineering plastics, we have developed a suitable technology for plastics metallization combined with a composite of thin electroplated metal layers onto the plastics' surface. The composite of the thin metal layers can be adjusted to achieve the highest possible shielding effectiveness according to the given frequency ranging from kHz to GHz. By plating only on one side of the enclosure, the height and distance to current carrying components within the enclosure can be dramatically minimized, offering additional benefits for safety and the usage of precious space in the vehicle.

To minimize the risks associated with EMI, our MKS' Atotech team of specialists has developed RoHs and REACH-compliant adhesion systems and electrolytically plated metal layers for engineered plastics and dielectrics to ensure proper electromagnetic shielding (EMS).

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The new generation of Cr(VI)-free plastics pretreatment

Covertron® 600 is a reliable, Cr(VI)-free and non-PFAS pretreatment for a large variety of polymers such as ABS, ABS/PC, but also for engineering plastics such as PP, PEI, or PEEK. Not only delivers the process similar performance and quality to the Cr(VI) benchmark, but its process length, quality, and performance are comparable to Cr(VI) processes too. Appearance, adhesion, and thermocycle requirements for its subsequent layers have been passed for all major OEMs.

Covertron 600 is compatible with immersion copper and nickel strike. It also allows for simple integration into existing plating lines, thus, has the potential to eliminate hexavalent chromium from decorative plating lines enabling plating on plastics to fulfill REACH regulations.

Features and benefits

- Applicable for ABS, ABS/PC, and engineering plastics such as PP, PEI, or PEEK
- Process length, quality, and performance are comparable to Cr(VI) processes
- Simple integration into existing lines
- Compatible with immersion copper and nickel strike
- Appearance, adhesion, and thermocycle are approved in automotive industry (tests passed for all major OEMs)

Advanced plating solution for the copper intermediate layer

Cupracid® UP: The advanced copper plating solutions are used as an intermediate layer between the nickel strike or immersion copper layer and the top electromagnetic shielding nickel iron layer. The processes offer excellent stress balance between metal and plastic and exhibit superb leveling. The versatile Cupracid UP processes are suitable for high temperatures (<35 °C) and provide an improved thickness distribution.

Features and benefits

- High-performance dye-based acid copper series providing superb leveling
- Excellent stress balance between metal and plastic
- Improved copper thickness distribution
- Versatile and suitable for high temperatures

Nickel iron alloys – the ideal surface coating to provide electromagnetic shielding

Due to their fundamental properties, magnetostriction and magnetic anisotropy, nickel iron alloys are the ideal surface coating to provide high magnetic permeability and low coercivity.

NiFe Shield: The electroplated, high nickel-containing alloy offers a cost and thickness-efficient solution to reduce EMI. It proves ideal for three-dimensional parts providing uniform thickness distribution on the surface, side walls, trenches, and recessed features. The deposited layer consists of a third alloying element, further increasing the resistivity and improving the magnetic properties.

Features and benefits

- Provides uniform thickness distribution
- Offers increased resistivity
- Exhibits improved magnetic characteristics
- Reduces metal thickness needed to achieve EMS
- Enables sandwich layer with copper for improved EMS