

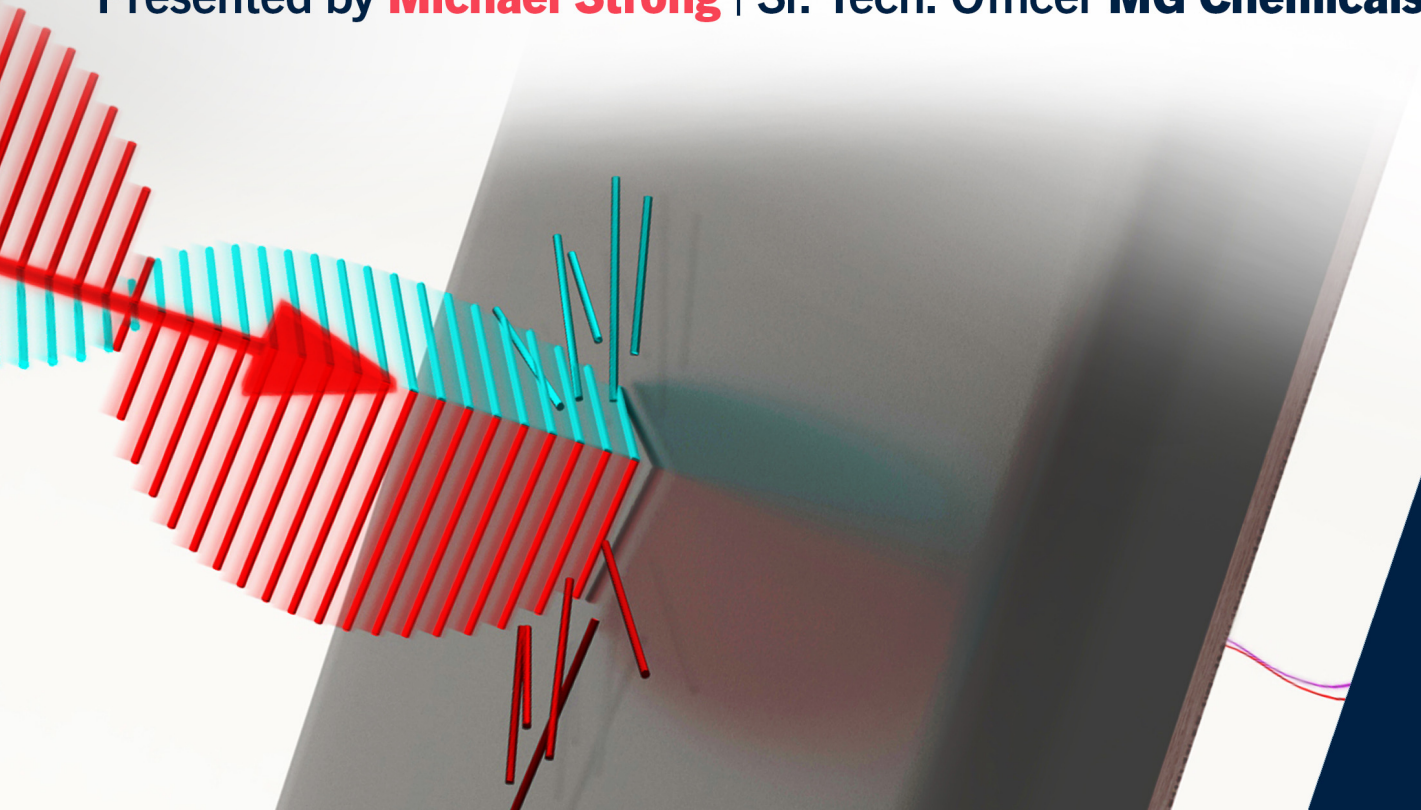
UNDERSTANDING CONDUCTIVE PAINTS

Webinar | Oct 9th 2025

Presented by **Michael Strong** | Sr. Tech. Officer **MG Chemicals**

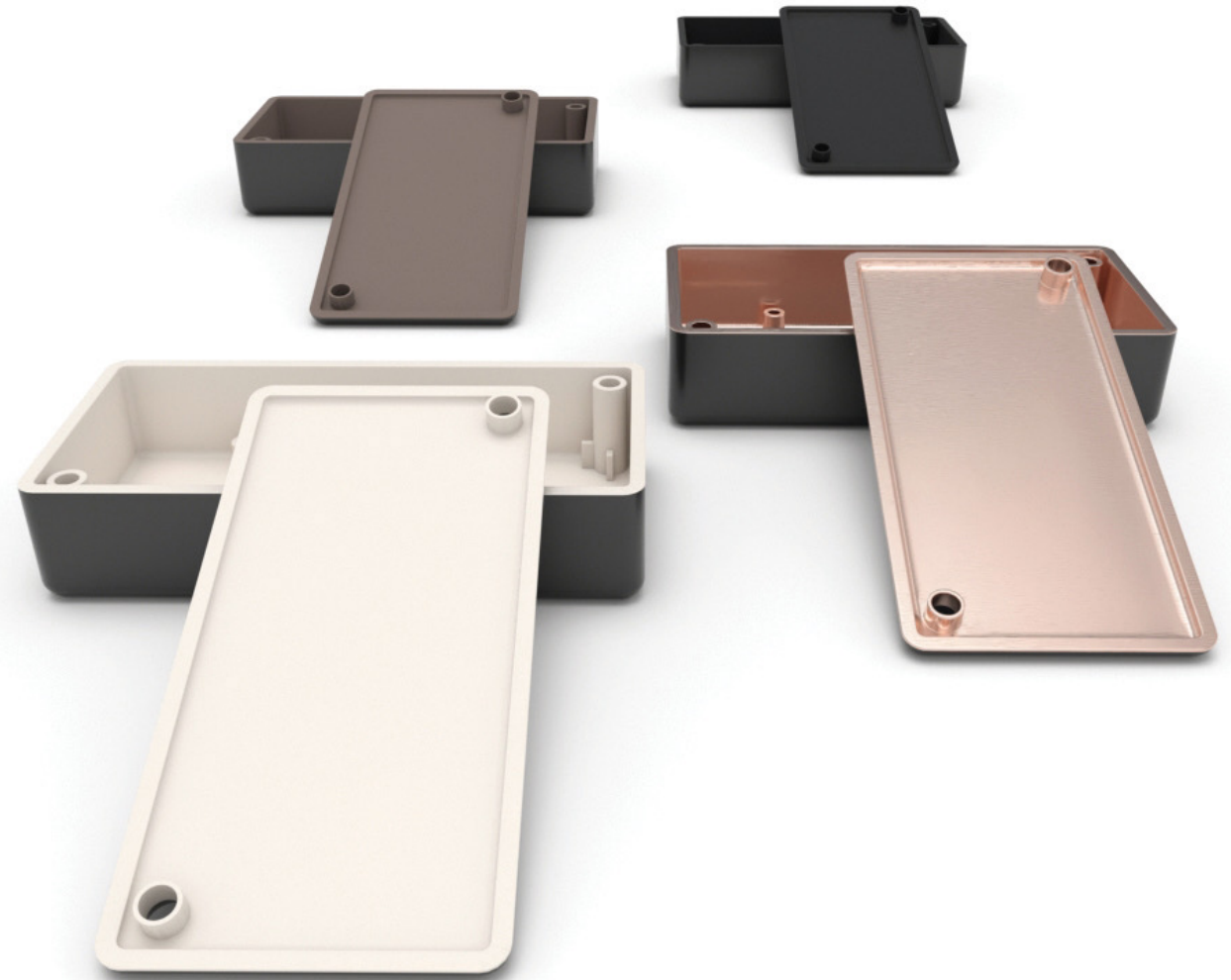


Live WEBINAR



Agenda

- Theory of EMI/RFI
- Solutions to EMI
- How to measure EMI Shielding
- Materials for EMI Suppression
- Comparison of Binder Systems
- Comparison of Conductive Flakes
- Properties of Conductive Coatings
- Applying Conductive Coatings
- Common Applications
- Summary



Theory of EMI/RFI

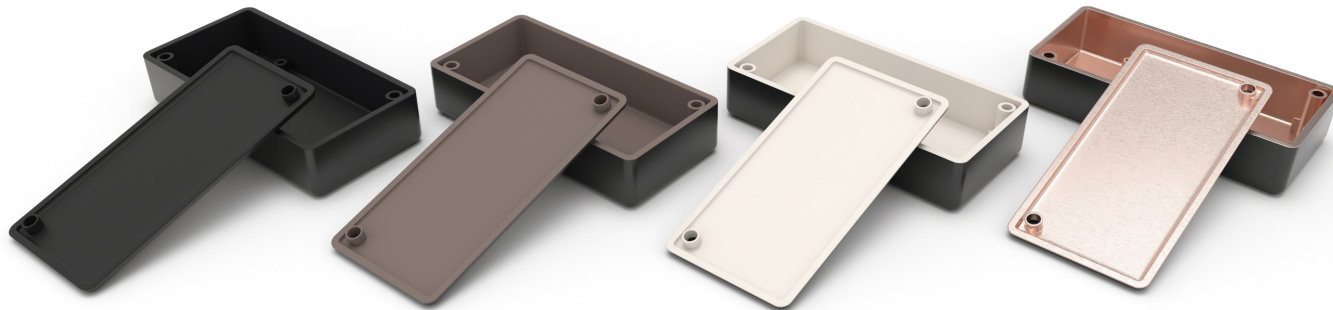
Interference is the unintended pickup of an external electromagnetic signal from a transmitting source. It can cause a device to malfunction or misfire.



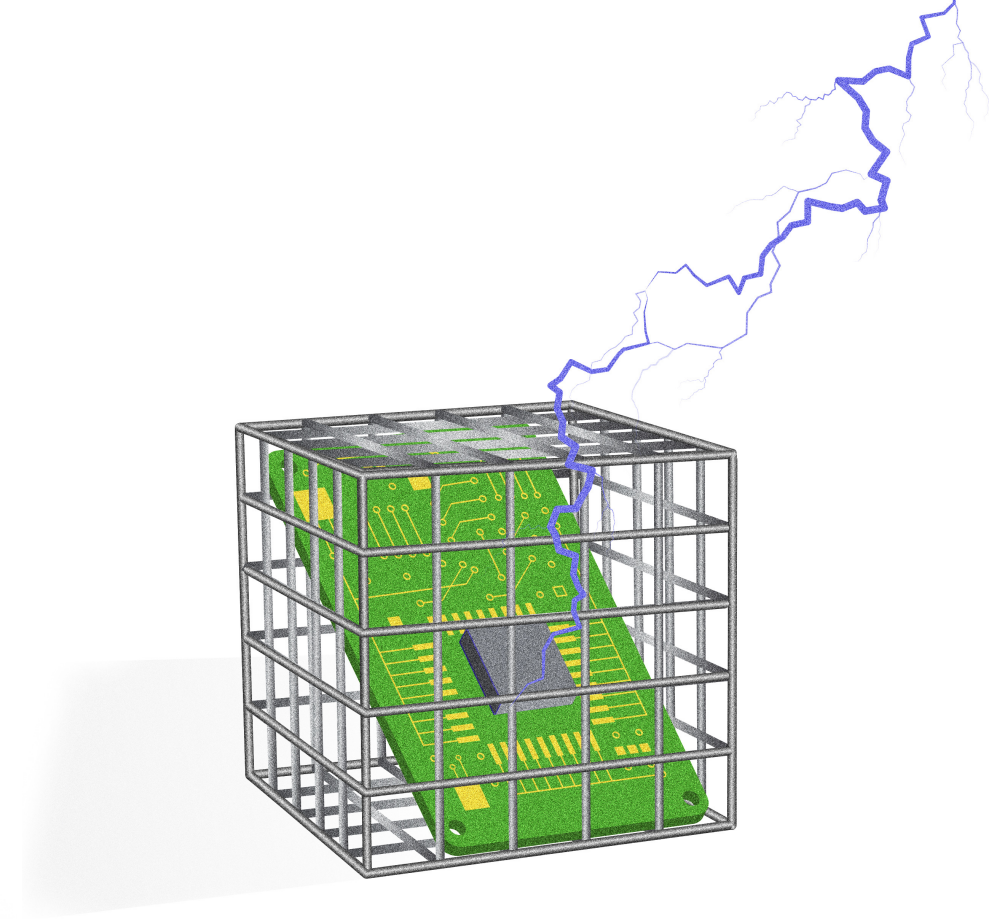
Solutions to EMI/RFI

A Faraday cage shields electronics by reflecting external signals, so they do not reach and communicate with devices.

PCB housing units such as the black Hammond boxes can be made into Faraday cages by applying an electrically conductive paint around the box's interior (including the inside of the lid).



Black Hammond boxes coated with AR Series Shielding Paints

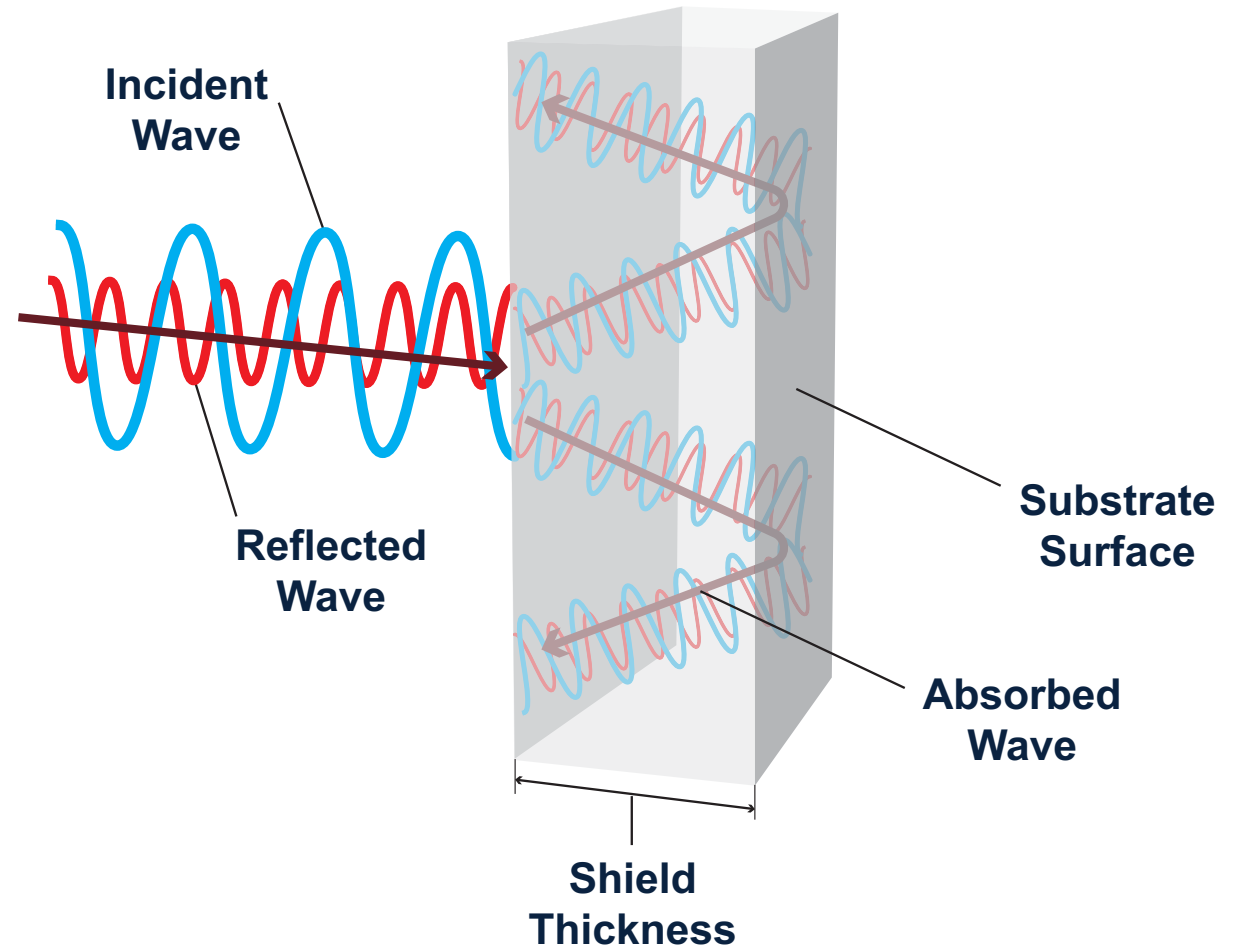


Solutions to EMI/RFI

Electrically conductive coatings work by reflecting electromagnetic waves off the surface, so they do not communicate with devices

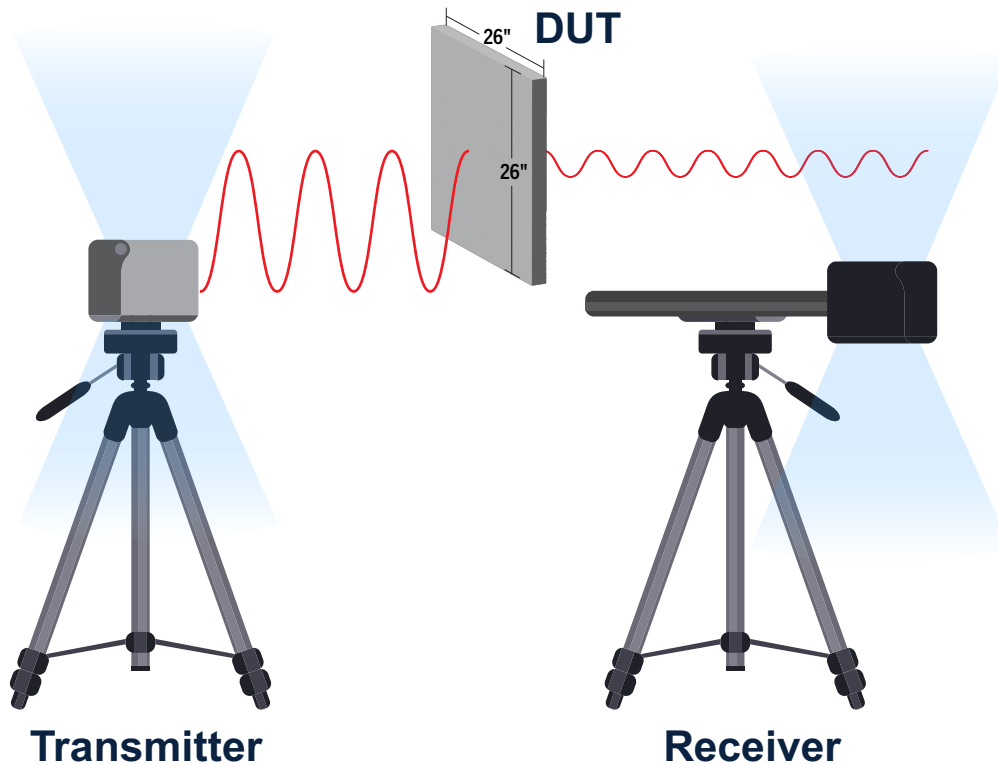
Some of the radiation is absorbed within the shield but most is reflected

Since absorption plays a minimal role in shielding, thicker coatings do not significantly improve shielding, rather it is important to get full surface coverage.



Measuring Shielding Performance

Standards such as IEEE std-299-1997 and Mil-Std-285 evaluate the shielding effectiveness of enclosures. Shielding effectiveness measured in decibels (dB).



Decibels (dB)	% Reduction
10	90
20	99
30	99.9
40	99.99
50	99.999
60	99.9999

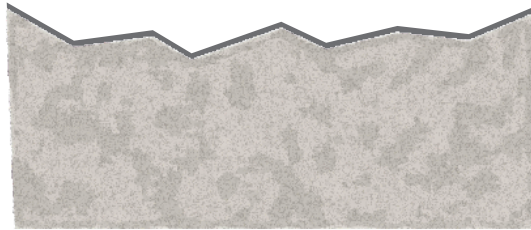
Advantages of Conductive Paint



With training, paint becomes easy to use



Conductive coating is durable and long-lasting



Conforms to complex shapes



Conductive coating can be scaled to production volumes

Binders used in Conductive Coatings

Main Features

Limitations

Comparison Chart

Acrylic

Easy to use

Reworkable

High Shielding

Poor Durability

Limited Adhesion

Epoxy

Excellent Adhesion

High Chemical
Resistance

Long Cure Time

Lowest Shielding

Water-based Urethane

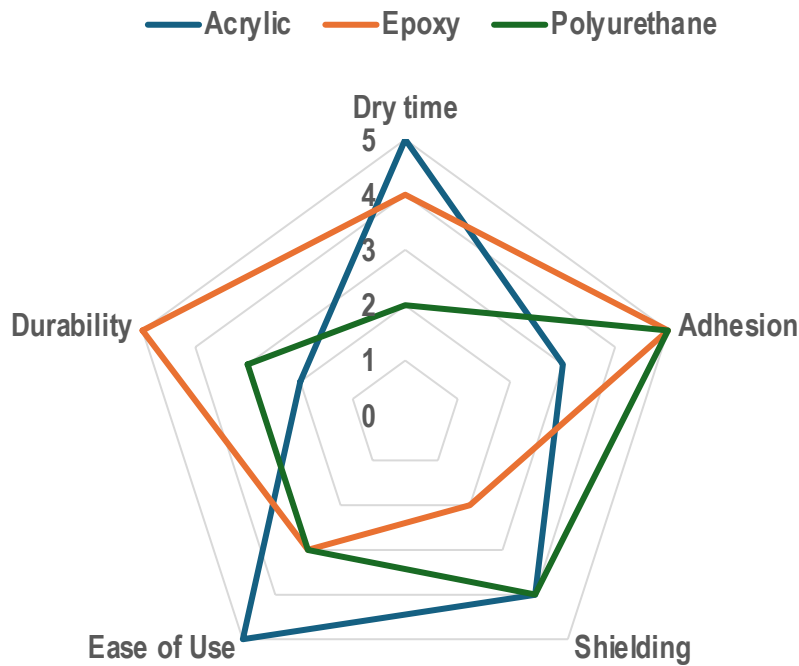
High Shielding

Reworkable

Non-flammable

Poor Durability

Longer cure



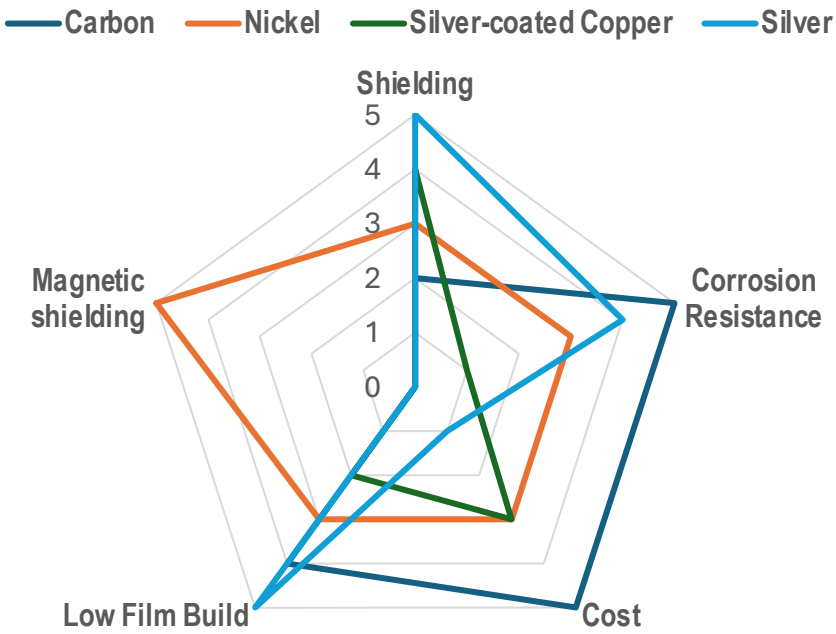
Electrically Conductive Flakes

Main Features

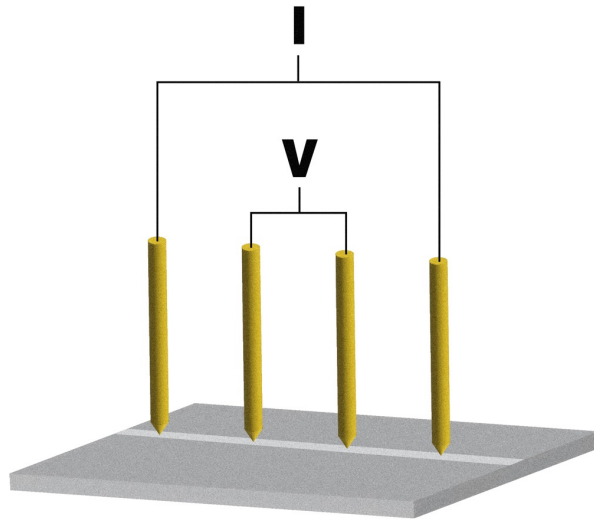
Limitations

Comparison Chart

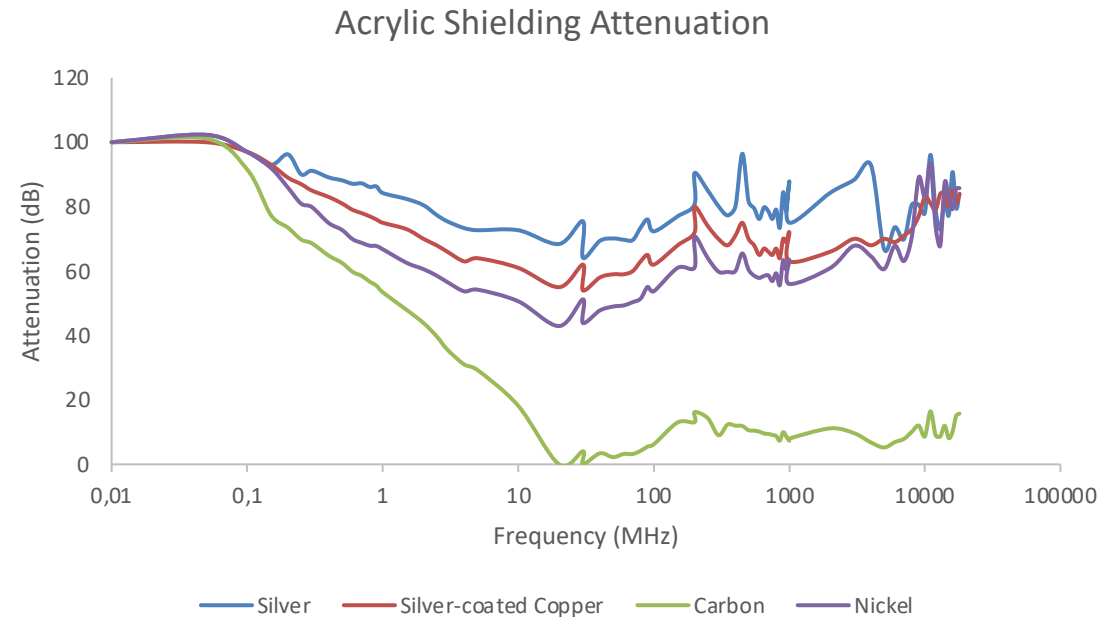
Carbon	Cost Effective Corrosion Resistant	Poor Shielding at high frequencies
Nickel	Broadband Shielding Magnetic Shielding	Limited Corrosion Resistance
AG Copper	Broadband Shielding Shielding > Nickel Cost << Silver	Poor Corrosion Resistance Higher Film Build
Silver	Superior Shielding Corrosion Resistant Low Film Build	High Cost



Conductive Paint Properties



Resistivity per MIL-STD 883J



Graphs of shielding attenuation vs. Frequency can indicate if a coating will provide sufficient shielding for EMC

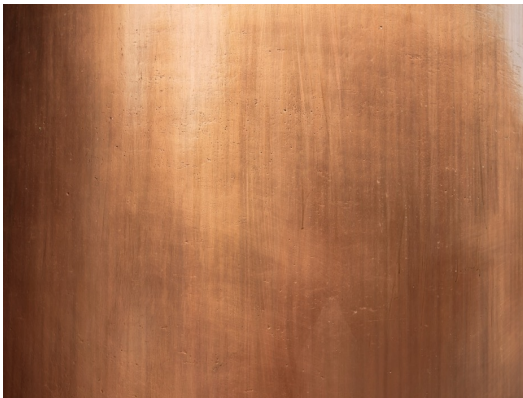
Mitigating Environmental Damage

Exposure to excess moisture, thermal cycling or salts oxidizes both Nickel and Silver-coated Copper rendering them less effective.

Carbon, Graphite and Silver are not prone to performance loss due to corrosion

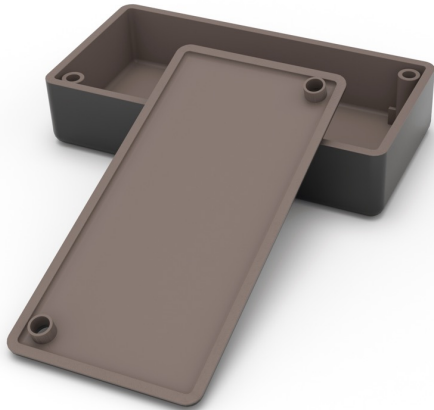
Protective topcoats can be applied to EMI coatings to protect against oxidation.

Water-based latex is recommended for acrylic and water-based coatings whereas solvent-based solutions can be used for epoxy coatings



Corrosion Resistance per ASTM B117

Product Highlight — 841AR



Features & Benefits

Provides effective EMI shielding
over a broad frequency spectrum

Strong corrosion resistance

HAPs-free solvent system

Available in liquid and aerosol

841AR-55ML	Bottle	55 mL	92.8 g
841AR-900ML	Can	850 mL	1.43 kg
841AR-3.78L	Can	3.6 L	6.08 kg
841AR-P	Pen	5.0 mL	7.57 g
841AR-340G	Aerosol	232 mL	340 g

* – custom sizes available upon request

Paint Application

- Step 1** Substrate cleaning is the first step required to ensure proper adhesion and wetting. IPA is an excellent solvent that can remove salts and oils from surfaces to mitigate coating issues. If applying to drywall, primer is not required but recommend cleaning with 10% TSP is recommended.
- Step 2** Dilution is often not needed, Recommended thinner with dilution ratio is mentioned in the product data sheet.
- Step 3** Mixing/agitation is required to ensure homogeneity. This would happen if the coating was being diluted; however, since most coatings do not require dilution, it is important to thoroughly mix the material and ensure the conductive filler is dispersed. This can be done with 2 minutes on a paint shaker or manual mixing. Filler settles quickly so operators are encouraged to shake up the coating every 5 minutes to redisperse.
- Step 4** Coating being applied by brush or roller can be applied like regular paint. Recommend using a horse hair type brush and a low nap roller.

Paint Application



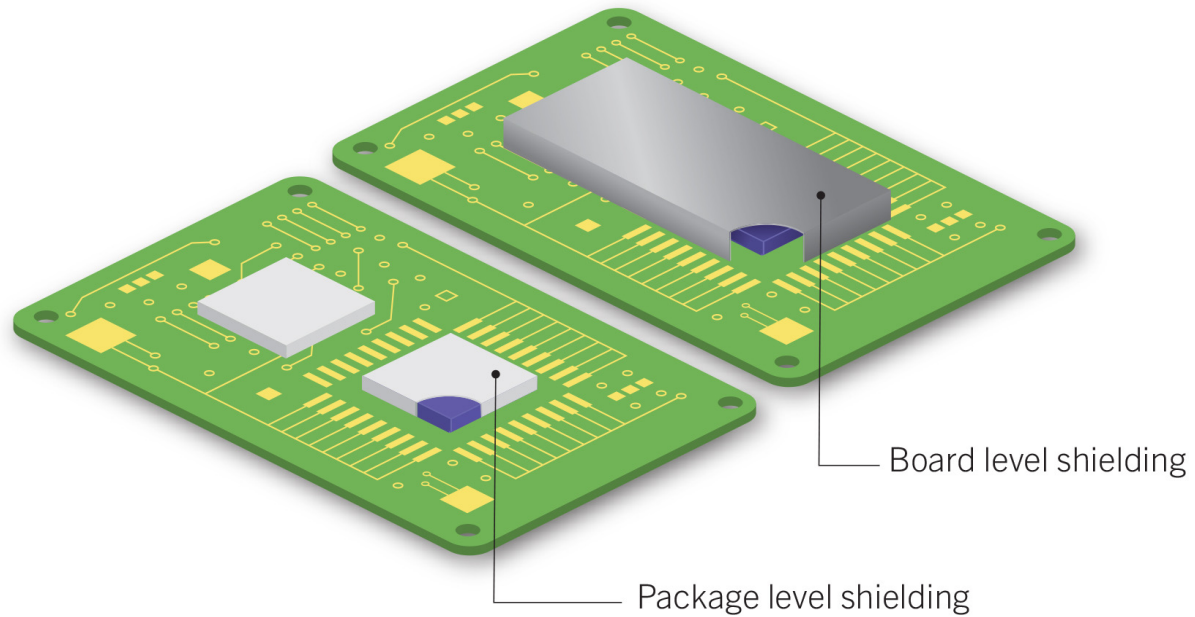
	LVMP	HVLP
Inlet Pressure	5-15 psi	5-15 psi
Air Flow	10-15 SCFM	8 SCFM
Air Cap.	5-10 psi	5-10 psi
Nozzle Diameter	1.2-1.4 mm	1.2-1.4 mm



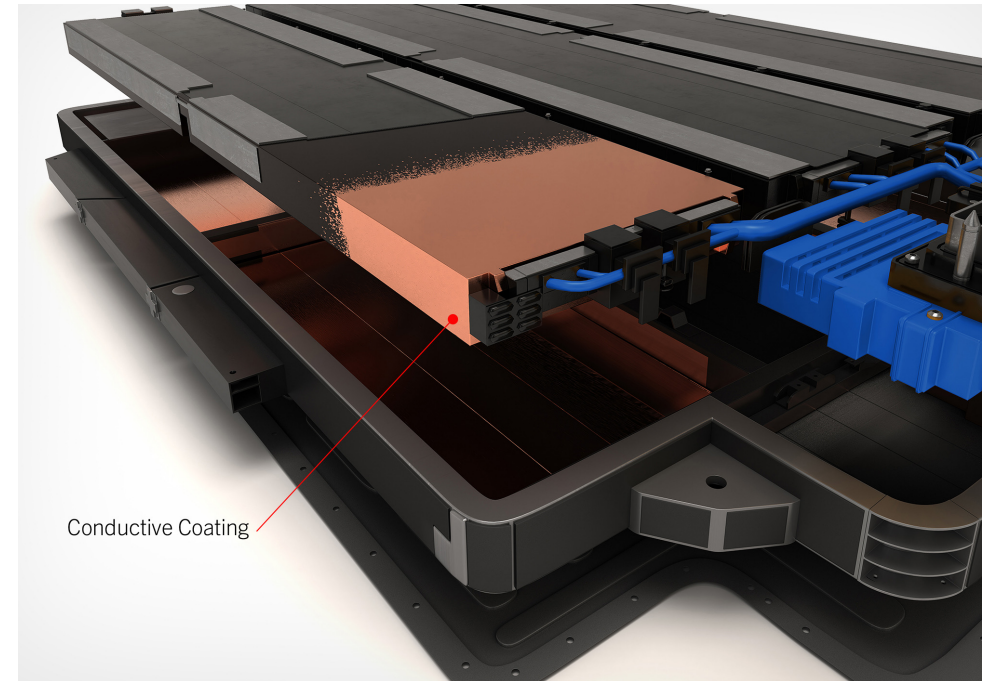
An agitated pressure pot has separate air lines. One to rotate a blade inside the pot to keep the liquid paint in constant circulation to avoid settling. The other is for the gun to atomize and spray the liquid coating. Use same spray settings as spray guns, circulation should be about 20 rpm.



Application



Replaces stamping and canning for package level shielding

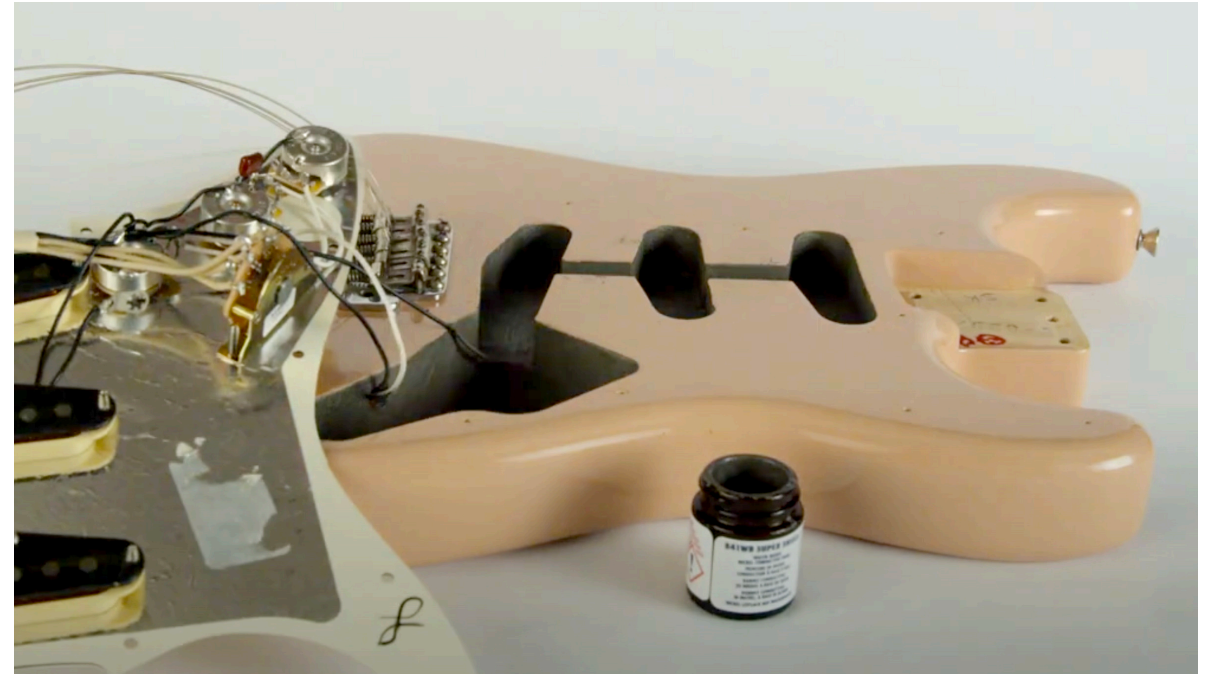


Coating exterior of battery cells to improve charging/discharging

Application



Amplify signal feedback in LIDAR systems for autonomous vehicles



Shielding guitar cavities to prevent hum

Application



Shielding external signals to allow Ion Mobility Spectroscopy for portable scanning devices

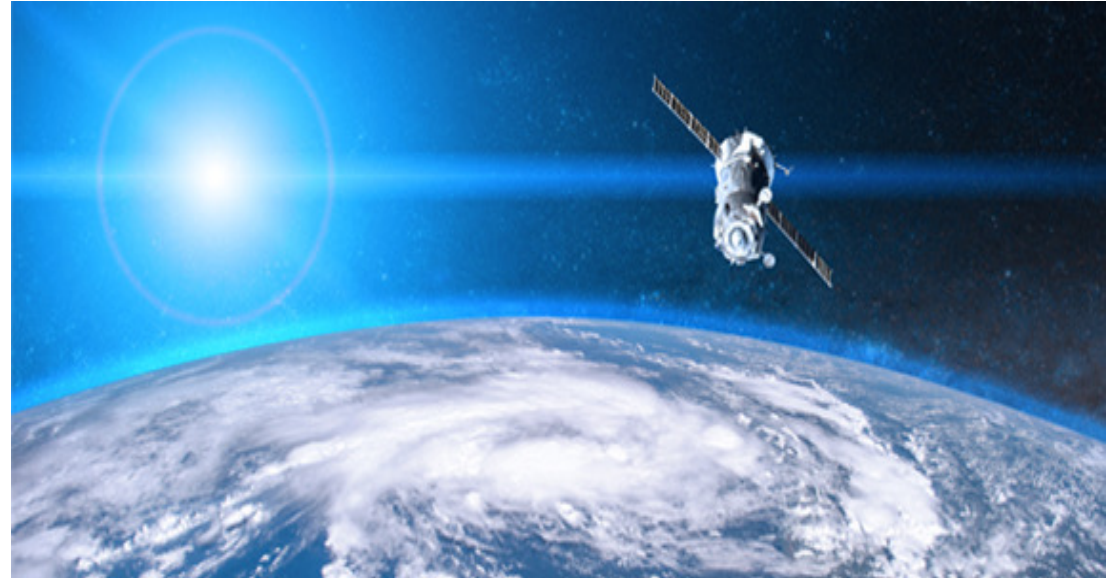


Conductive coatings expand the reflectivity of radio frequencies hitting satellite dishes

Application

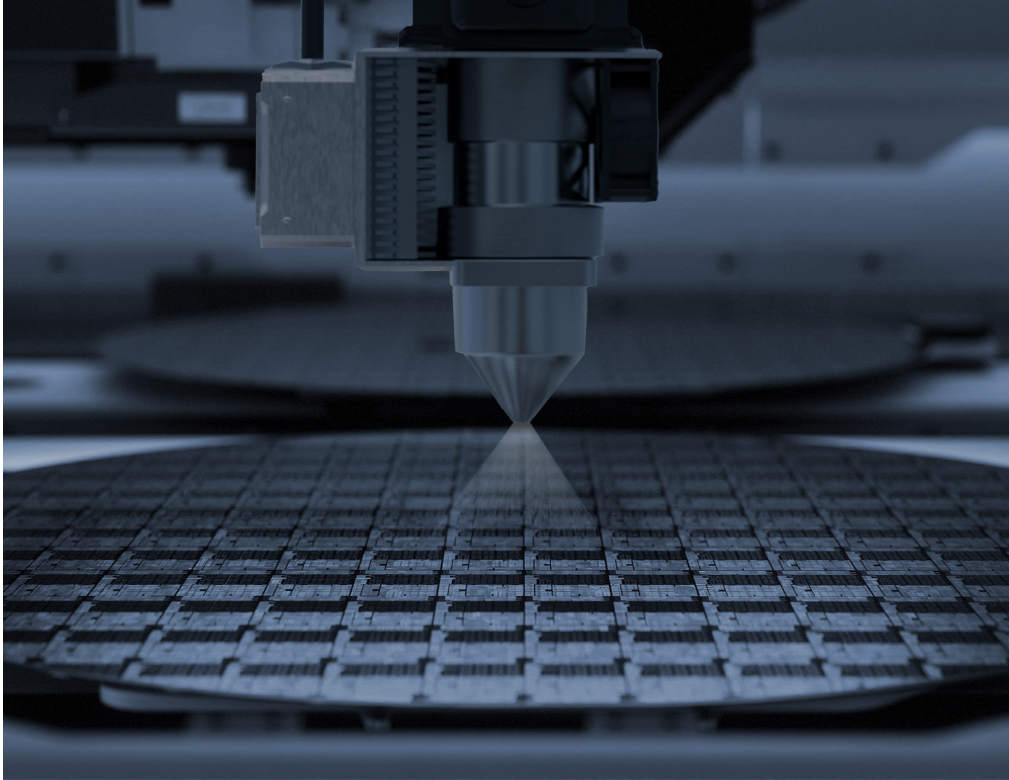


Shielding plastic housing units for military tactical headsets

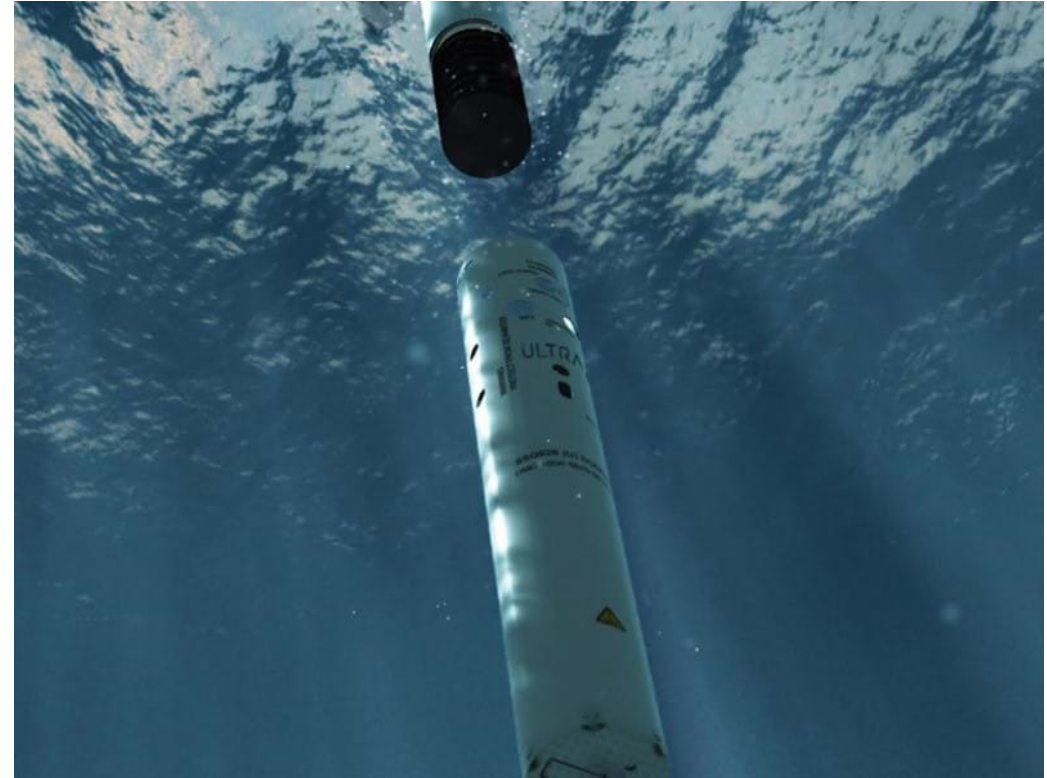


Conductive coatings are applied onto satellites to protect them from the harmful radiation of outer space.

Application



Replacing sputter coating on Si wafers for PCB components



Coating end caps on Sonobuoys to ensure signal fidelity of acoustics

Application



Shielding interior spaces like server rooms in offices



Shielding MRI rooms to eliminate signal interference

Summary

- Electrically conductive coatings suppress electromagnetic noise, preventing neighbouring devices from inadvertently sending signals to one another
- Coatings are superior then other materials in conforming to complex geometries, providing durability, longevity and can easily be scaled to production levels
- MG Chemicals has extensive lines of acrylic, epoxy and water-based conductive coatings suiting a variety of substrates and environments
- Key properties when evaluating a coating's suitability for an application are attenuation, resistivity and overall durability.
- These coatings can be applied similar to conventional paints. For higher throughput, coating can be applied by spray gun or using an agitated pressure pot.
- Common applications include replacing sputter coating, signal amplification, guitar shielding, helping charge/discharge for EV batteries, amplifying reflection on satellite dishes, shielding tactical headset and anything that requires noise cancellation



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Thank You

