Description

The 843AR *Super Shield™ Silver Coated Copper Conductive Coating* is a one-part durable acrylic lacquer pigmented with a highly conductive silver coated copper flake. It utilizes a ready to spray, solvent based system, with no heat cure necessary. The cured coating is smooth, hard, and abrasion resistant. It provides good adhesion to plastics, excellent conductivity, and high frequency shielding.

Applications & Usages

The 843AR is designed to provide a conductive coating to the interior of plastic electronic enclosures to suppress EMI/RFI emissions. It excels when superior levels of shielding are required.

The 843AR is commonly used by manufacturers of these devices:

- Sensors
- Controllers
- Receivers
- Test equipment
- Scientific equipment
- Medical equipment
- Communication devices
- Satellite dishes and radar systems
- Antennas
- Aerospace applications
- Electric vehicles
- Networking gear, firewalls
- Military equipment
- Cellphones, laptops, PDA's
- GPS's, navigation systems
- TV's, monitor's, and displays
- Consumer electronics
- Electronic sporting equipment
- Audio equipment
- Electric guitars and other amplified instruments
- Drones and other RC vehicles

Other applications for 843AR include:

- Repairing damage to existing shielding
- Conductive undercoat for electroplating
- Providing electric continuity for circuits

Benefits and Features

- **UL Recognized** (File # E202609)
- **Provides strong EMI/RFI shielding over a broad frequency range**
- **Volume resistivity of 0.0003 Ω·cm**
- **Smooth, durable, and abrasion resistant**
- **Ready to spray system, no let down necessary**
- **Available in aerosol format**
- **Quick dry time, no heat cure required**
- **Mild solvent system**
- **Strong adhesion to acrylic, ABS, polycarbonate, and other injection molded plastics**
- **Excellent adhesion to wood and ceramics**
- **Low VOC; HAP Free; Does not contain toluene, xylene, or MEK**

ENVIRONMENT
RoHS Compliant
Low-VOC

843AR Technical Data Sheet
Super Shield™ Silver Coated Copper Conductive Coating

Usage Parameters

Properties	*Value*
Recoat Time (liquid)	3 min
Drying Time @22 °C [72 °F]	24 h
Drying Time @65 °C [149 °F]	30 min
Shelf Life	2 y
Theoretical HVLP Spray Coverage [c]	≤15 000 cm^2/L ≤1.50 m^2/L ≤8 800 in^2/gal ≤61 ft^2/gal

b) Idealized estimate based on a coat thickness of 2.0 mil [50 μm] and 65% transfer efficiency

Temperature Ranges

Properties	*Value*
Constant Service Temperature	-40 to 120 °C [-40 to 248 °F]
Intermittent Temperature Limits	-50 to 125 °C [-58 to 257 °F]
Storage Temperature Limits [b]	-5 to +40 °C [23 to 104 °F]

b) The product must stay within the storage temperature limits stated.

Principal Components

Name	***CAS Number***
Silvered Copper	*7440-22-4 + 7440-50-8*
Acrylic Resin	*25608-33-7*
Acetone	*67-64-1*
Dimethyl carbonate	*616-38-6*
Heptan-2-one	*110-43-0*

Properties of Cured 843AR

Electrical & Magnetic Properties	*Method*	*Value*	
Volume Resistivity	Method 5011.5 in MIL-STD-883H	0.00030 Ω·cm	3300 S/cm
Surface Resistance [a]		*Resistance*	*Conductance*
1 coat @2.3 mil	Square probe	0.071 Ω/sq	14 S
2 coats @4.0 mil	Square probe	0.018 Ω/sq	55 S
3 coats @5.4 mil	Square probe	0.011 Ω/sq	91 S
Magnetic Class		Diamagnetic (Non-magnetic)	
Relative Permeability		<1.0	
Shielding Attenuation for 76 μm [3.0 mil]	IEEE STD 299-1997		
>10 to 100 kHz	"	84 dB to 89 dB	
>100 kHz to 1 MHz	"	73 dB to 89 dB	
>1 MHz to 10 MHz	"	47 dB to 70 dB	
>10 MHz to 100 MHz	"	41 dB to 60 dB	
>100 MHz to 1 GHz	"	59 dB to 71 dB	
>1 GHz to 10 GHz	"	58 dB to 67 dB	
>10 GHz to 18 GHz	"	48 dB to 68 dB	

Physical Properties	***Method***	***Value***
Paint Type	—	Lacquer (Thermoplastic)
Color	Visual	Light metallic brown
Abrasion Resistant	—	Yes
Blister Resistant	—	Yes
Peeling Resistant	—	Yes
Water Resistant	—	Yes
Mechanical Properties	***Method***	***Value***
Adhesion [b)]	ASTM D3359	5B
Pencil Hardness [b)]	ASTM D3363	F, medium
Environmental & Ageing Study	***Method***	***Value***
Salt Fog Test @35 °C [95 °F], 96 h [b)]	ASTM B117-2011	
Resistivity before	MG-ELEC-120	0.08 Ω/sq
Resistivity after	"	3.3 Ω/sq
% Conductivity	"	2%
Cross-Hatch Adhesion	ASTM D3359-2009	5B
Cracking, unwashed area	ASTM D661-93	None
Visual Color, unwashed area	ASTM D1729-96	Discoloration (green), oxidized

a) Surface resistance is given in Ω/sq and the corresponding conductance in Siemens (S or Ω^{-1})
b) Tested using HVLP spray gun application on acrylonitrile butadiene styrene (ABS) coupons

The coating surface resistance and attenuation value is provided in Figures 1 and 2.

Surface Resistance by Coating Thickness

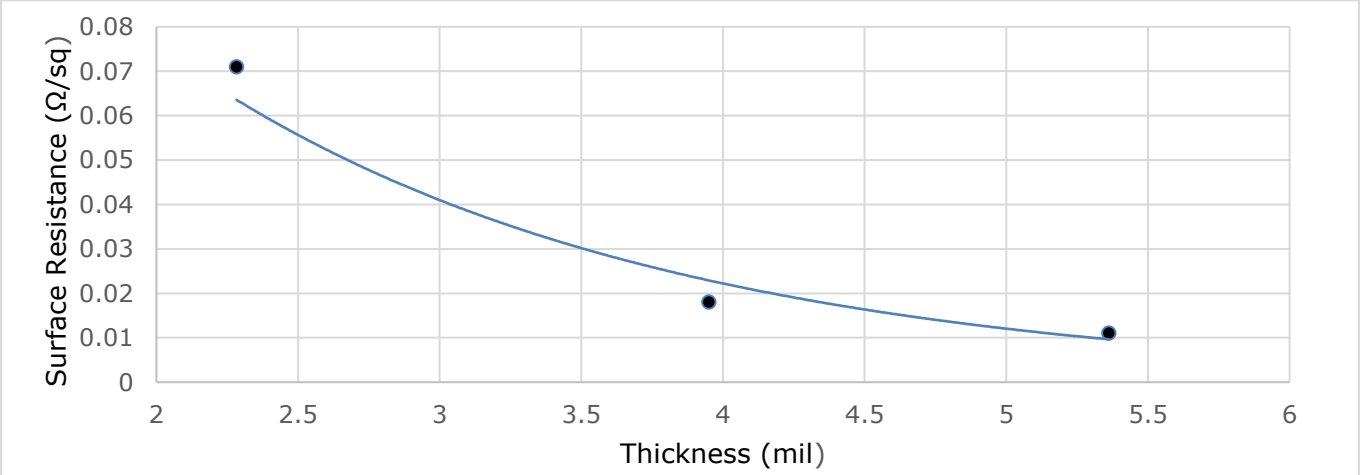


Figure 1. Silvered copper coating surface resistance at different thicknesses (the dots indicate typical successive coat thicknesses)

Shielding Attenuation

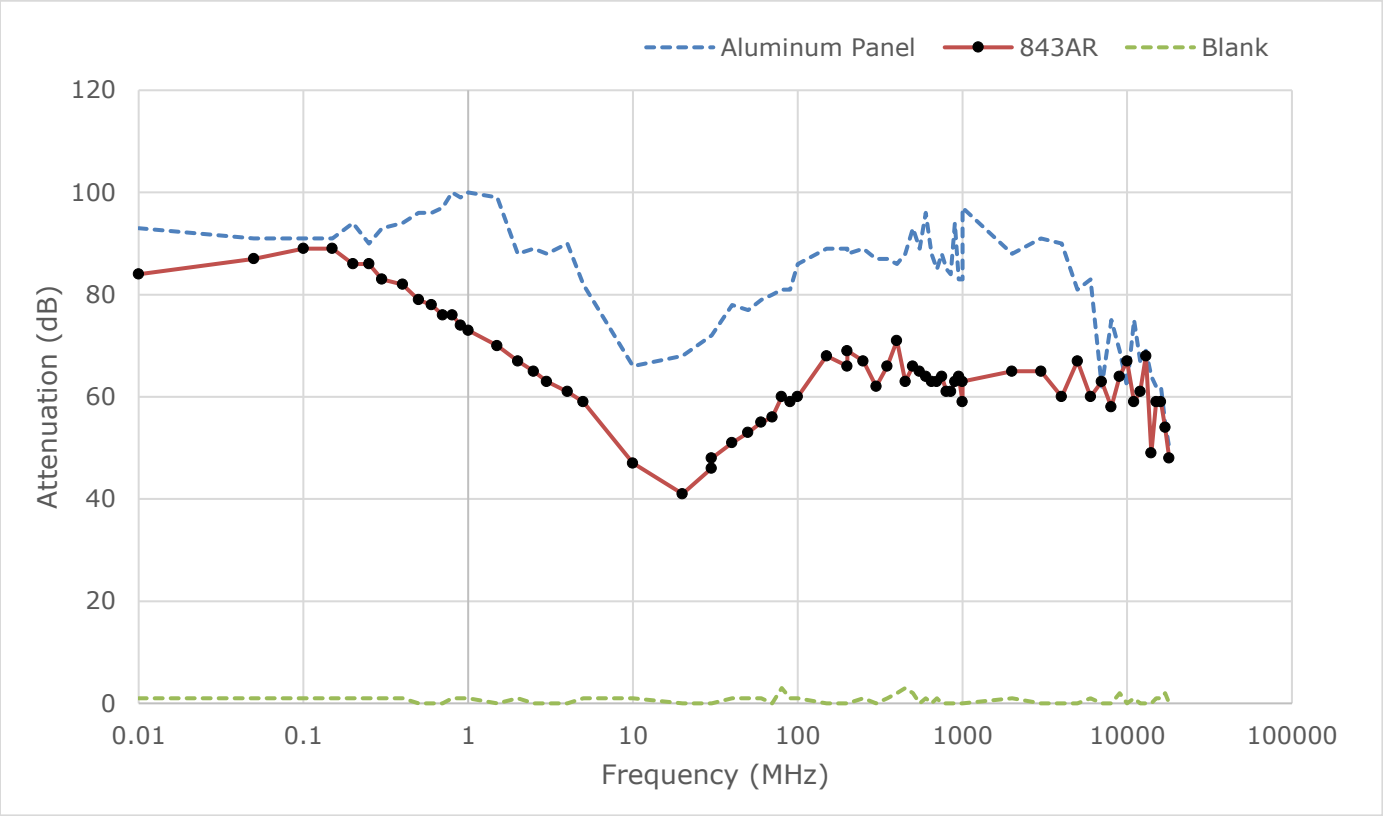


Figure 2. Attenuation of 843AR coating at different frequencies

Properties of Uncured 843AR

Physical Properties	*Mixture*
Color	Light metallic brown
Density @25 °C [77 °F]	1.1 g/mL
Solids Percentage (wt/wt)	31%
Viscosity @25 °C [77 °F]	<30 cP
Flash Point	-17 °C [1.4 °F]
Odor	Acetone-like

Compatibility

Chemical—The silver coated copper is quite resistant to oxidation, except in environments that contain contaminants like H_2S or ozone which tarnish its surface.

The thermoplastic resin is dissolved by common paint solvents like toluene, xylene, acetone, and MEK. This allows great coating repair and work characteristics, but it does make the coating unsuitable for solvent rich environments.

Adhesion—The 843AR coating adheres to most plastics used to house printed circuit assemblies; however, it is not compatible with contaminants like water, oil, and greasy flux residues that may affect adhesion. If contamination is present, clean the surface to be coated first.

843AR Adherence Compatibility

Substrate	***Note***
Acrylonitrile Butadiene Styrene (ABS)	Chemically etches [a)] and adheres well to this substrate.
Polybutlylene Terephtalate (PBT)	"
Polycarbonate	"
Polyvinyl Acetate (PVA)	"
Polyvinyl Chloride (PVC)	"
Acrylics or Acrylic Paints	Adheres well to clean surface
Epoxy, FR4 substrate	"
Polyurethane	Adheres well to clean surface for most urethane types
Wood	Adheres well with surface preparation

a) Etching is similar to sanding, except that it also softens the surface helping to meld the paint to the plastic for superior adhesion.

ATTENTION! Use with care on thin plastics or on plastics where you want to keep original surface intact. The 843AR spray contains a controlled amount of solvents designed to chemically etch plastic surfaces to help adhesion by melding the acrylic coating into the plastic substrate. This prevents flaking or peeling.

For chemically sensitive substrates, use the 4351-1L thinner lessens the etching effects.

Storage

Store between -5 and 40 °C [23 and 104 °F] in a dry area.

Health, Safety, and Environmental Awareness

Please see the 843AR **Safety Data Sheet** (SDS) for greater details on transportation, storage, handling and other security guidelines.

Environmental Impact: The regulated VOC (Volatile Organic Compound) content is 17% (187 g/L) by EPA and WHMIS standards.

This product meets the European Directive
2011/65/EU Annex II (ROHS);
recasting 2002/95/EC.

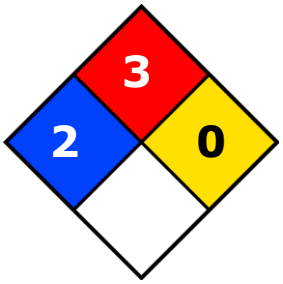
Health and Safety: The solvents in 843AR can ignite if exposed to flames or sparks and can cause respiratory track irritation. If ignited, then flame flash back is possible. Use in well-ventilated area.

Solvents can cause skin irritation and have some reproductive effects. Wear safety glasses or goggles and disposable gloves to avoid exposures.

HMIS® RATING

HEALTH:	* 2
FLAMMABILITY:	3
PHYSICAL HAZARD:	0
PERSONAL PROTECTION:	

NFPA® 704 CODES



Approximate HMIS and NFPA Risk Ratings Legend:
0 (Low or none); 1 (Slight); 2 (Moderate); 3 (Serious); 4 (Severe)

Application Instructions

The 843AR Silver Coated Copper Conductive Coating can be easily applied by the paint brush, spray gun, or dip method.

For best results, apply thin wet coats as opposed to using thick coats. We recommend a final dry film thickness of at least 1.0 mil [25 μm]. Follow the procedure below for ensure optimal conductivity.

Material & Equipment

- Mixing spatula
- Clean paint brush ***OR*** HVLP spray gun ***OR*** dip tank systems
- Liquid agitator, agitated pot, or recirculation system
- Thinner/solvent
- Personal protection equipment (See 843AR-Liquid SDS)

Paint Dilution Ratio

The 843AR paint is ready-to-use for either brush or spray application. It doesn't normally require dilution.

Surface Preparation

Clean oil, dust, water, solvents, and other contaminants and let the surface dry fully.

Spray Gun Application Instructions

Read the procedure below fully and make necessary adjustments to get the required coat thickness for your needs. Typically, one coat results in a dry film thickness of roughly 2.0 mil [50 μm].

Spray Equipment

Use a HVLP (high-volume, low pressure) using the initial settings described in the following table. Adjust these settings and recommendations as required.

Initial Setting Recommendations

Air Cap	#3 HVLP		
Pressure	*Inlet* 23 psi	*Air flow* 13.5 SCFM [a)]	*Air cap* 10 psi
Fluid Tip	1.3 mm [0.051”]	1.5 mm [0.059”] [b)]	

Note: These recommendations are based on a generic paint gun and may differ by brands. Please consult your spray gun manufacturer’s guide.

a) SCFM = standard cubic foot per minute
b) If no or reduced let down is performed, this may be a better tip choice.

To apply the coating

1. Mix paint thoroughly with mechanized paint shaker, paint mixer, or spatula.
2. Make a test spray. Adjust the spray settings for best flow and spray quality, and establish an appropriate distance to avoid paint runs. A distance between 20 to 25 cm (8 to 10 in) is recommended.
3. Spray a thin and even coat onto a vertical surface to be coated. For best results, start your movement off-surface, press the trigger, and only release off-surface at the end of the stroke. Use a uniform movement of the spray gun parallel to the surface.
4. Wait 3 to 5 minutes and spray another coat. The delay avoids trapping solvent between coats.
5. Apply additional coats until desired thickness is achieved. (Go to Step 3.)
6. Let dry for 5 minutes (flash off time) at room temperature.

NOTE: Ideally, your spray gun will be equipped with liquid agitation system. If not, swirling the paint gun container slightly in between spray applications slows settling.

ATTENTION! Spraying overly thick coats may cause paint runs and hamper solvent evaporation. Prefer the application of many thin mist coats rather than fewer thicker wet coats.

To cure at Room temperature

- Let air dry 24 hours

To accelerate cure by heat

- After flash off, put in oven or under heat lamp at 65 °C for 30 min.

NOTE: Coats that are very thick require more time to dry. Heat curing ensures optimal performance.

ATTENTION! If heat curing, do not exceed 65 °C as this may cause surface defects due to solvents evaporating off too quickly.

Packaging and Supporting Products

Cat. No.	*Packaging*	*Net Volume*		*Net Weight*		*Packaging Weight*	
843AR-900ML	Can	850 mL	1.8 pt	927 g	2.05 lb	1.29 kg	2.84 lb
843AR-3.78L	Can	3.6 L	3.8 qt	3.93 kg	8.66 lb	4.73 kg	10.4 lb
843AR-140G	Aerosol	117 mL	3.95 fl oz	140 g	4.93 oz	TBD	TBD
843AR-340G	Aerosol	284 mL	9.6 fl oz	340 g	12 oz	"	"

Note: TBD = To Be Determined

Thinners & Conductive Coating Removers

- *Thinner*: Cat. No. 435-1L, 435-4L
- *Thinner 1*: Cat. No. 4351-1L, 4351-4L

Technical Support

Contact us regarding any questions, suggestions for improvements, or problems with this product. Application notes, instructions and FAQs are located at www.mgchemicals.com.

Email: support@mgchemicals.com

Phone: +(1) 800-340-0772 (Canada, Mexico & USA)
+(1) 905-331-1396 (International)
+(44) 1663 362888 (UK & Europe)
Fax: +(1) 905-331-2862 or +(1) 800-340-0773

Mailing address:

Manufacturing & Support
1210 Corporate Drive
Burlington, Ontario, Canada
L7L 5R6

Head Office
9347–193rd Street
Surrey, British Columbia, Canada
V4N 4E7

Warranty

M.G. Chemicals Ltd. warrants this product for 12 months from the date of purchase by the end user. *M.G. Chemicals Ltd.* makes no claims as to shelf life of this product for the warranty. The liability of *M.G. Chemicals Ltd.* whether based on its warranty, contracts, or otherwise, shall in no case include incidental or consequential damage.

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