



ISO 9001 Registered Quality System.
Burlington, Ontario, Canada QMI File # 004008

Super Shield™ Nickel Conductive Coating 841AR Technical Data Sheet

841AR-Aerosol

Description

The 841AR *Super Shield™ Nickel Conductive Coating* is a one-part durable acrylic lacquer pigmented with a highly conductive nickel flake, packaged in convenient aerosol format. It utilizes a solvent based system with no heat cure necessary. The cured coating is smooth, hard, and abrasion resistant. It provides strong adhesion to plastics, excellent conductivity, and strong corrosion resistance, even in marine environments.

Applications & Usages

The 841AR is designed to provide a conductive coating to the interior of plastic electronic enclosures to suppress EMI/RFI emissions. It excels when corrosion resistance is a concern.

The 841AR 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
- Cable boxes
- 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 841AR include:

- Repairing damage to existing shielding
- Conductive undercoat for electroplating
- Protecting metal surfaces from oxidation
- Providing electric continuity for circuits
- Grounding

Benefits and Features

- **Provides effective EMI/RFI shielding over a broad frequency range**
- **Volume resistivity of 0.0076 $\Omega \cdot \text{cm}$**
- **Smooth, durable and, abrasion resistant**
- **Available in liquid 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**
- **Corrosion resistant, suitable for marine environments**
- **Low VOC; HAP Free; Does not contain toluene, xylene, or MEK**

ENVIRONMENT

RoHS Compliant
Low-VOC



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Usage Parameters

Properties	Value
Recoat time (liquid)	3 min
Drying Time @25 °C [77 °F]	24 h
Drying Time @65 °C [149 °F]	30 min
Shelf Life	2 y
Theoretical 340G Spray Can Coverage ^{a)}	≤2 500 cm ² ≤390 in ²

a) Idealized estimate based on a coat thickness of 50 µm [2.0 mil] and 50% 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. **ATTENTION!** Aerosol container will be crushed at ≤-26.5 °C [≤15.7 °F].

Principal Components

Name	CAS Number
Nickel Flake (high purity)	7440-02-0
Acrylic Resin	25608-33-7
Acetone	67-64-1
Dimethyl carbonate	616-38-6
Heptan-2-one	110-43-0

Properties of Cured 841AR

Electric & Magnetic Properties	Method	Value	
Volume Resistivity	Method 5011.5 in MIL-STD-883H	0.0076 Ω·cm	130 S/cm
Surface Resistance		<i>Resistance</i> ^{a)}	<i>Conductance</i> ^{a)}
1 coat @2.1 mil	Square probe	0.62 Ω/sq	1.6 S
2 coats @4.2 mil	Square probe	0.38 Ω/sq	2.6 S
3 coats @6.1 mil	Square probe	0.34 Ω/sq	2.9 S
Magnetic Class		Ferromagnetic	
Relative Permeability		≥100	
Shielding Attenuation for 51 µm [2.0 mil]	IEEE STD 299-1997		
>10 to 100 kHz	"	84 dB to 89 dB	
>100 kHz to 1 MHz	"	65 dB to 88 dB	
>1 MHz to 10 MHz	"	39 dB to 60 dB	
>10 MHz to 100 MHz	"	32 dB to 52 dB	
>100 MHz to 1 GHz	"	52 dB to 61 dB	
>1 GHz to 10 GHz	"	56 dB to 74 dB	
>10 GHz to 18 GHz	"	49 dB to 68 dB	



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<i>Physical Properties</i>	<i>Method</i>	<i>Value</i>
Paint Type	—	Lacquer (Thermoplastic)
Color	Visual	Dark grey
Abrasion Resistant	—	Yes
Blister Resistant	—	Yes
Peeling Resistant	—	Yes
Water Resistant	—	Yes
<i>Mechanical Properties</i>	<i>Method</i>	<i>Value</i>
Adhesion ^{b)}	ASTM D3359	5B
Pencil Hardness ^{b)}	ASTM D3363	HB, soft
<i>Environmental & Ageing Study</i>	<i>Method</i>	<i>Value</i>
Salt Fog Test @35 °C [95 °F], 96 h ^{b)}	ASTM B117-2011	
Resistivity before	MG-ELEC-120	380 mΩ/sq
Resistivity after	"	510 mΩ/sq
% Conductivity after	"	75%
Cross-Hatch Adhesion	ASTM D3359-2009	5B
Cracking, unwashed area	ASTM D661-93	None
Visual Color, unwashed area	ASTM D1729-96	Slightly darker

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 are plotted in Figures 1 and 2.

Surface Resistance by Coating Thickness

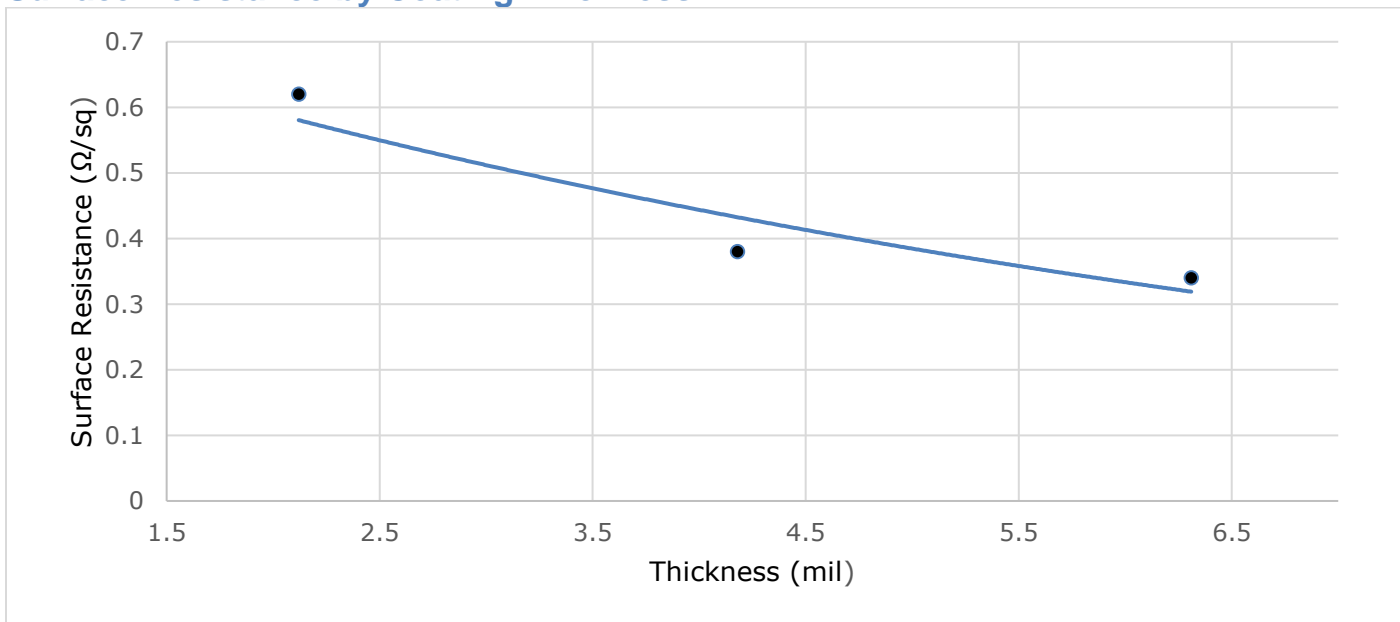


Figure 1. Nickel conductive coating surface resistance at different thicknesses (the dots indicate typical successive coat thicknesses)

Shielding Attenuation

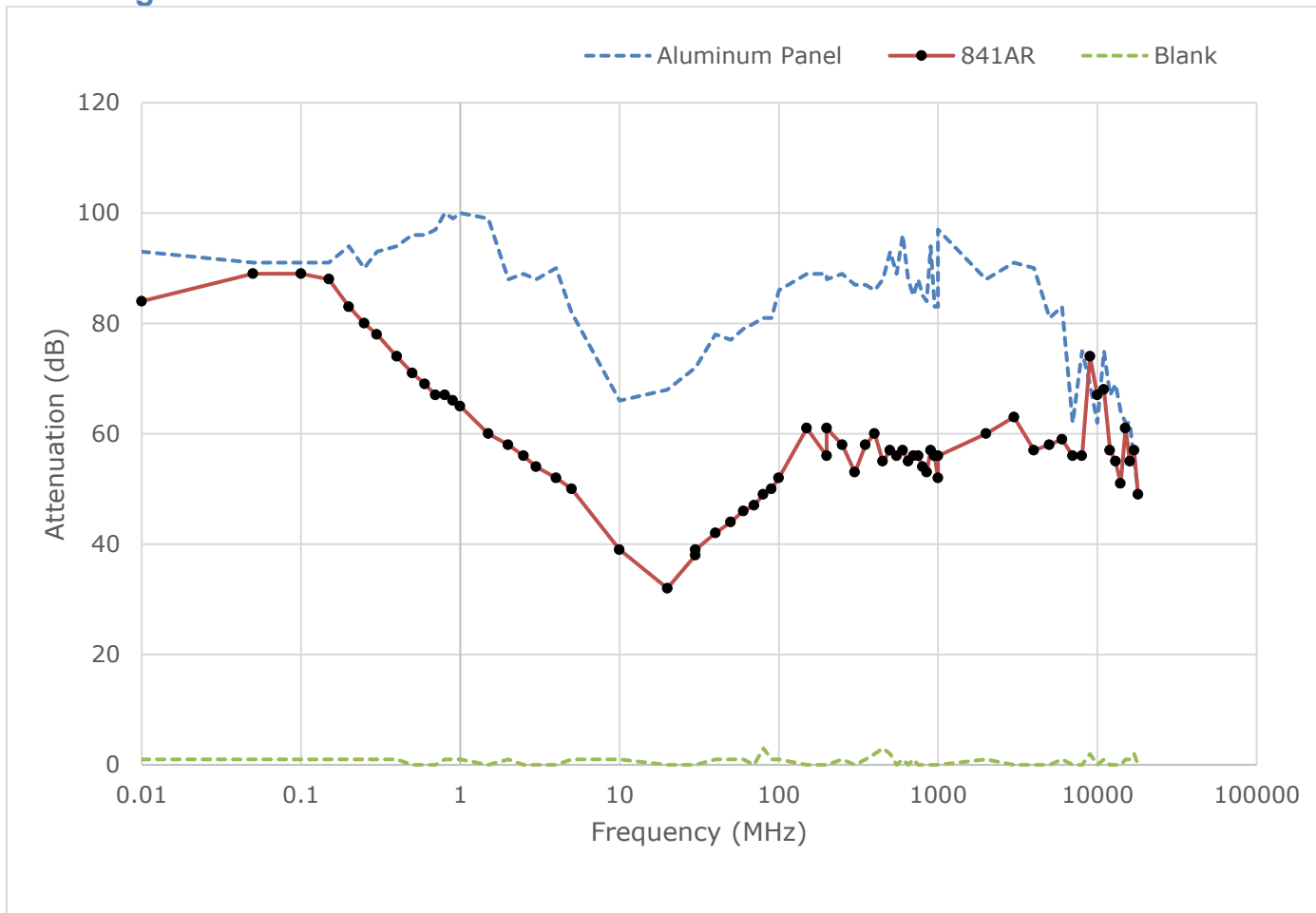


Figure 2. Attenuation of 841AR coating at different frequencies

Properties of Uncured 841AR

<i>Physical Property</i>	<i>Mixture</i>
Color	Dark grey
Density @25 °C [77 °F]	1.3 g/mL
Solids Percentage (wt/wt)	38%
Viscosity @25 °C [77 °F] ^{a)}	61 cP [45 mm ² /s]
Flash Point	-17 °C [1.4 °F]
Odor	Ethereal

a) Brookfield viscometer at 60 RPM with spindle LV S61



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Compatibility

Chemical—Nickel has good resistance to oxidation in a variety of corrosive environments, including marine environments. In normal atmosphere or freshwater, nickel typically corrodes less than 0.0025 mm per year. Since nickel forms a passive protective film on its surface that slows down or stops further corrosion, the passive nickel resists corrosion better than pure copper fillers. In addition, nickel is harder than its silver or copper filled counterparts, helping provide greater durability.

The thermoplastic acrylic resin is incompatible common paint solvents like toluene, xylene, acetone, and MEK. Further, it will not withstand chronic exposures to engine oils, fuels and other similar hydrocarbons. While this makes the coating unsuitable for solvent rich environments, it does offers great repair and rework characteristics.

Adhesion—The 841AR coating adheres to ABS, PBT, and most materials found on 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.

841AR Adherence Compatibility

Substrate	Note
Acrylonitrile Butadiene Styrene (ABS)	Chemically etches ^{a)} and adheres well to this substrate.
Polybutylene Terephthalate (PBT)	"
Polycarbonate	"
Polyvinyl Acetate (PVA)	"
Polyvinyl Chloride (PVC)	"
Polyamide (Nylon 6^6)	"
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! Do not use on thin plastics or on plastics where you want to keep original surface intact. The 841AR 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. Using the 4351-1L thinner lessens the etching effects for chemically sensitive substrates.

Storage

Store between -5 and 40 °C [23 and 104 °F] in dry area away from sunlight. Temperatures below or above these outer limits will result in the container being crushed and/or ruptured.

Health, Safety, and Environmental Awareness

Please see the 841AR-Aerosol **Safety Data Sheet** (SDS) for greater details on transportation, storage, handling and other security guidelines.

Environmental Impact: The VOC (Volatile Organic Compound) content is 34% (456 g/L) by EPA and WHMIS standards.

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

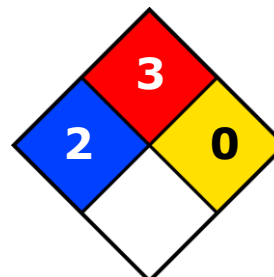
Health and Safety: The solvents in 841AR can ignite if exposed to flames or sparks and can cause respiratory track irritation. If ignited, then flame flash back is possible. Use in well-ventilated area.

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)

Aerosol Application Instructions

Follow the procedure below for best results. We recommend a coat with a dry film thickness of roughly 1 mil [25 µm]. For thicker coats, apply many thin coats as opposed to spraying a single thick coat.

Prerequisites

- Ensure surface to be coated is oil free, dust free and clean

Material & Equipment

Personal protection equipment (See 841AR-Aerosol SDS)

To apply the coating

1. Shake the can vigorously for 2 minutes. You should hear the bead swirling around freely at the bottom if the settled material has lifted back in solution.
2. Spray a test pattern. This step ensures good flow quality and helps establish appropriate distance to avoid runs.
3. At a distance of 15 to 20 cm (6 to 8 inches), spray a thin and even coat onto a vertical surface. For best results, use spray-and-release strokes with an even motion to avoid excess paint in one spot. Start and end each stroke off the surface.
4. Before the next coat, rotate the surface 90° or change stroke direction (horizontal or vertical) to ensure good coverage.
5. Wait 1 minute, shake can, and spray another coat. The delay avoids trapping solvent between coats.
6. Apply additional coats until desired thickness is achieved (go to Step 3).
7. Let dry for 3 minutes (flash off time) at room temperature.

NOTE: Swirling the aerosol can slightly while waiting prevents settling.

ATTENTION!

- Holding the can at a non-vertical angle during the spray application may result in uneven application.
- Coats that are applied too thick cause runs and hamper solvent evaporation.
- Spraying onto horizontal surfaces is not recommended.

After use, clear the nozzle of the aerosol

1. Immediately invert the aerosol can upside down.
2. Press button until clear propellant comes out. The propellant should become clear in a few seconds.
3. Ensure the face of the button is clean of residues by wiping with a cloth or paper towel.

ATTENTION! Failure to clear nozzle can lead to valve being blocked open or closed in a non-noticeable way.

- If blocked closed, the can will not be usable.
- If blocked slightly open, the contents can spill out overnight creating a mess.

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.



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Packaging and Supporting Products

<i>Cat. No.</i>	<i>Packaging</i>	<i>Net Volume</i>		<i>Net Weight</i>		<i>Packaging Weight</i>	
841AR-P	Pen	5.0 mL	0.16 fl oz	7.57 g	0.26 oz	0.03 kg	0.07 lb
841AR-340G	Aerosol	232 mL	7.84 fl oz	340 g	12 oz	TBD	TBD
841AR-15ML	Jar	12 mL	0.4 fl oz	20.2 g	0.71 oz	0.08 kg	0.17 lb
841AR-150ML	Can	150 mL	5.0 fl oz	253 g	8.93 oz	0.30 kg	0.67 lb
841AR-900ML	Can	850 mL	1.79 pt	1.43 kg	3.16 lb	1.77 kg	3.90 lb
841AR-3.78L	Can	3.60 L	3.8 qt	6.07 kg	13.3 lb	6.80 kg	15.0 lb

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, improvement suggestions, 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)

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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