



# AMCL

## ADVANCED MATERIALS AND COATINGS LABORATORY

### SIX DECADES OF EXPERIENCE IN ADVANCED THERMAL SPACE COATINGS SCIENCE AND CHEMISTRY

Hill's Advanced Materials and Coatings Laboratory (AMCL) is a leading provider of commercial spacecraft thermal control coatings. We conform to NASA's strict specifications, considering custom data about orbital patterns, environmental factors like temperature and radiation level, and more. Our coatings help control the external temperature of spacecraft and limit UV radiation absorption allowing instruments to operate more effectively.

#### STATE-OF-THE-ART PRODUCTION FACILITIES

With a complete inventory of optical testing, mixing and application equipment, we can tailor thermal control coatings to fill our customers' specific needs. We research and develop new material systems with tailorable properties in support of our current "heritage" materials.

Our large-scale production facilities include four cryofreezers for inventory storage; a high bay with a 23' x 18' x 11' climate-controlled, OSHA-compliant spray booth and preparation area; and both inorganic and organic spray laboratories. Each lab space is devoted to specific Thermal Control Material Systems (TCMS) to limit cross-contamination and is equipped with a wide variety of spray equipment including a turbine sprayer with Croix spray gun, Binks spray guns and airbrushes.



#### TEST EQUIPMENT ON SITE

- Lambda 9 UV/VIS/NIR spectrophotometer with integrating sphere for measuring solar absorptance ( $\alpha$ )
- Gier Dunkel DB-100 total infrared reflectometer used to determine total emittance of materials (E)
- Surface Optics 410-solar portable reflectometer and ET-100 thermal handheld emissometer
- Wet film and eddy current dry film thickness measuring equipment
- Grind test, viscosity, density measuring equipment, surface, and volume resistivity meters
- TML, CVCM per ASTM-E-595 tests (element materials technology)
- Thermal shock and adhesion testing per ASTM standards



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Hill is a global, all-domain defense provider. Hill's mission is to deliver the world's most powerful ships and all-domain solutions in service of the nation, creating the advantage for our customers to protect peace and freedom around the world. As the nation's largest military shipbuilder, and with a more than 135-year history of advancing U.S. national security, Hill delivers critical capabilities extending from ships to unmanned systems, cyber, ISR, AI/ML and synthetic training. Headquartered in Virginia, Hill's workforce is 44,000 strong. For more information, visit Hill.com.

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# PERFORMANCE OF AEROSPACE COATINGS

## STANDARD (NON-ELECTROSTATIC DISSIPATIVE) TCMS

Coating	Composition / Temperature Capability	Typical Optical Properties		Applications
		$\alpha \pm 0.02$	$E_N \pm 0.05$	
Z-93P	White Inorganic 800°C	0.15	0.90	Highest stability and temperature capability, well-suited for long-term missions (used on ISS)
S13GP:6N/LO-1	White Organic Flexible 200°C	0.15	0.90	High stability, silicone base improves durability and ease of application, ideal for most LEO missions
S13NT:6N/LO-1	Off-White Organic Flexible 200°C	0.29	0.89	Variation of S13GP:6N/LO-1 for intermediate absorptance needs
MH21:6N/LO	Black Organic Flexible 200°C	0.98	0.90	High absorptance coating, silicone base, made with HII's "black glass" pigment
MH2200	Flat Black Optical Absorber 400°C	0.96	0.90	Best suited for absorbing surfaces to prevent light reflection

## ELECTROSTATIC DISSIPATIVE TCMS

Coating	Composition / Temperature Capability	Typical Optical Properties		Typical Surface Resistivity	Applications
		$\alpha \pm 0.02$	$E_N \pm 0.05$	( $\Omega/\square$ )	
Z93C55	White Inorganic 500°C	0.15	0.90	$10^6$ to $10^8$	Conductive analog to Z-93P, ideal for longer missions outside of LEO (used on Mars Rovers/Reconnaissance, JUNO)
DS13N:6N/LO-HP	White organic flexible 200°C	0.15	0.90	$10^7$ to $10^{10}$	Conductive analog to S13GP:6N/LO-1, ideal for electrostatically sensitive surfaces
MH21:6NC/LO	Black organic flexible 200°C	0.98	0.90	$10^6$ to $10^8$	Conductive analog to MH21:6N/LO for high absorptance/ESD needs

### Notes:

$\alpha$  = solar absorptance

$E_N$  = total normal emittance

$\Omega/\square$  = ohms per square

Application by gas spraying: all

Curing at room temperature: all

Good thermal shock resistance: all

Atomic oxygen (AO) resistant: all

Outgassing: inorganic, total mass loss (TML) = 0.10 to 0.25 and collectable volatile condensable material (CVCM) = 0.00 to 0.01

Outgassing: organic, TML  $\leq$  1.00 and CVCM  $\leq$  0.10%

**For questions or pricing, contact [TheAMCL@hii-tds.com](mailto:TheAMCL@hii-tds.com)**



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