TECHNOLOGY TRANSFER FROM ISRO

ndian Space Research Organisation (ISRO) has informed ICC about the Technology Transfer Program of ISRO. It has been informed that various technologies in the chemical area are available for know-how transfer to Indian industries. Information received from ISRO on following technologies is published for readers:

- Coating Compound EPY 1061
- BMT Ceramics
- PSC-NC-020 Glue
- Ultra High Absorber Black Electroless Nickel Plating Tech.
- Thermal Control Coating
- Silver Plating on Waveguides

Contact person in ISRO is Mr. R. Rajiv, Engineer-SD, TT&IC, INDIAN SPACE RESEARCH ORGANISATION, Department of Space, Govt. of India, Antariksh Bhavan, New BEL Road, Bangalore – 560 231 Tel: 080-2341 5474.

We are sure this information will be useful to the readers. In case of any further assistance, please contact ICC Secretariat at Mumbai.

COATING COMPOUND EPY1061

ISRO has developed different types of adhesive compounds catering to specific applications in Launch Vehicles and Satellites. These materials may also find various industrial applications such as bonding, sealing, coating, potting, laminating, molding etc.

EPY1061 is an amidoamine modified epoxy based system specially developed to protect the metal surfaces from corrosion in aqueous strontium perchlorate medium. This coating and sealing system consists of two main components Part A(resin) and Part B(hardener) and a third component Part C which is a solvent. Parts A, B and C are mixed in a specified ratio and sprayed into the metal surface using spray gun to get corrosion resistant coating. The coating adheres well to the metal substrate and reaches fully cured condition at room temperature in 72 hours.

TYPICAL PROPERTIES/ CHARACTERISTICS

1	Colour and consistency	Redcoloured viscous liquid
2	Viscosity at 25° C (cps)	20000-40000
3	Pot life/Gel time	> 25 minutes.
4	Flow Time, Part A, B & C mixed	35 – 50 seconds.
5	Cure	Ambient
6	Lap shear strength on Al-Al at RT	> 90 ksc

ISRO offers to license the know-how to capable small/ medium scale specialty polymer manufactures, looking for new product line. Interested parties are requested to respond immediately with details of their present activities and product lines, capabilities, infrastructure, their own product assessment and their plans for implementing the technology.

FOR FURTHER DETAILS, PLEASE CONTACT:

Technology transfer & industrial co-ordination division VIKRAM SARABHAI SPACE CENTRE, ISRO Thiruvanathapuram - 695 022 Ph: 0471- 2564081 Fax: 0471- 2564134 Email: a_muralidhar@vssc.gov.in

BMT CERAMICS

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Indian Space Research Organisation at its Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram has developed various kinds of ceramics. Dielectric ceramics find application as resonators (DR), substrates, antennas etc. in terrestrial as well as space communications systems ranging from UHF to mm-band frequencies. Their advantages are small size, light weight, temperature stability etc. Globally, a few materials have been manufactured for use in specific range of microwave spectrum.

Barium Magnesium Tantalite (BMT) is a typical perovskite ceramic, which is widely used in oscillators, multiplexers, filters etc above 10GHz in satellite and terrestrial microwave communication system. The technology has been developed in collaboration with CMET, Thrissur. This dielectric, coming in the medium permittivity materials, possesses extremely low dielectric loss (tan δ ~10-5) in microwave and millimetre wave frequency ranges.

This indigenously developed BMT is equivalent to 8700 series of Trans-Tech and D series of Murata that are used in 10-25 GHz range.



BMT CERAMICS

TYPICAL PROPE

1	Bulk density	(Target)	< 8 g/cm3
		(Achieved)	7.45 ± 0.1 g/cm3
	Dielectric constant (ɛr)	(Target)	V
		(Achieved)	24±1
2	Unloaded Q-factor (Qu)	(Target)	15,000 @ 5.6 GHz
		(Achieved)	28,000 @ 5.6 GHz
		(Achieved)	22,000 @ 7.5 GHz
3	Unloaded Q-factor (Qu)	(Target)	8,000 @ 10 GHz
		(Achieved)	20,000 @ 10 GHz
4	Temp. coeff. of freq. (τf)	(Target)	< 7 ppm/K
		(Achieved)	6 ± 1.0 ppm/K

ISRO is willing to offer the technology of BMT ceramics to eligible interested parties who are in the field of manufacturing similar items. Interested entrepreneurs / industries are requested to contact the address given below with all relevant particulars regarding their line of current activity, infrastructure available, market assessment of the product, financial arrangements made, turn over and sales of their products for the past years and a copy of their latest annual report. Alternatively, you can also fill in the response form provided in this website.

FOR FURTHER DETAILS, PLEASE CONTACT:

Head

Technology Transfer & Industrial Coordination Division (TTIC)

Vikram Sarabhai Space Centre (VSSC), ISRO Thiruvananthapuram – 695 022 Ph: 0471-256 4819, 256 5133; Fax: 0471-256 4134 e-mail: krm_ananthanarayanan@vssc.gov.in

PSC-NC-020

Indian Space Research Organisation (ISRO) at its Vikram Sarabhai Space Centre (VSSC) has developed PSC-NC-020, a glue based on cellulose polymer blends, which has a wide range of applications in aerospace area.

THE TYPICAL PROPERTY OF PSC-NC-020 IS GIVEN BELOW:

Composition	Give based on cellulosic			
	blend with vinyl polymers			
Consistency	Transparent liquid			
Dry residue	20 % (Minimum)			
Time for complete drying	1 hour (Maximum)			
Appearance of film	Transparent			
Peel strength between cotton	100 kg/m (Minimum)			
fabric and plywood				

ISRO is willing to offer the know-how to eligible interested industries/entrepreneurs in India who are in the field of handling similar technologies. Parties interested in acquiring this know-how may write with details of their present activities, market exposure, requirements, plans for commercialisation, infrastructure and technical expertise available with a copy of latest annual report to the address given below.

FOR FURTHER DETAILS, PLEASE CONTACT:

Technology Transfer & Industrial Coordination Division Vikram Sarabhai Space Centre, ISRO Thiruvananthapuram – 695 022 Ph : 0471-256 5133, 256 5695 Fax : 0471-256 4134 E mail: krm_ananthanarayanan@vssc.gov.in

ULTRA HIGH ABSORBER BLACK ELECTROLESS NICKEL PLATING TECHNOLOGY

Indian Space Research Organisation at its ISRO Satellite Centre (ISAC), Bangalore has developed a process of electroless nickel blackening on Invar to produce ultrahigh solar absorber surface. The blackened Ni-P film provides higher solar absorptance in the order of 99.5% and is extremely suitable for optical instruments. These coating are produced by selective etching of electroless nickel coating in strong oxidizing acids.



SPECIFICATIONS OF BLACK NICKEL COATING

Solar absorptance, □S ~0.990, with bloom

~0.950, without bloom

The coating has a unique surface morphology consisting of dense array of microscopic, conical pores perpendicular to the surface. This structure acts as a light trap is capable of absorbing 99.5% light in solar region (300-2300 nm). The pore diameter, pore depth and pore spacing range from a fraction of micrometers to a few micrometers.

SI.No	Test Conducted	Test Specification	Result
1	Visual	4X	No Patches
2	Adhesion	Scotch Tape Test	Good Adhesion
3	Thickness	Micro Sectioning	Black Coating : 35 to 45 µm
			Ni-P : 40 to 50 µm
4	Micro Hardness	50 g load,	Black Coating : 575 VHN
		10 seconds	Ni-P : 590 VHN
5	Thermal Stability	200 ° C, 48 hrs	No discoloration and patches
6	Humidity	95±0.5% at 50±1	
		° C, 48 hrs	No effect on coating
7	Corrosion	5 % NaCl ,	Passed
		pH 7.0 , 7 days	
8	Thermal Cycling	-45 ° C to +80 ° C,	
		100 cycles	No change in properties
9	Thermo Vacuum	-45 ° C to +80 ° C	No change in properties,
	Performance	2 hrs,10-5 torr,	No degradation
		10 cycles	

TESTING & EVALUATION

APPLICATION

- 1. Ultra high absorber black coatings are of paramount importance in the design of terrestrial and space borne optical instruments and sensors used for measurements in ultra violet, visible and infrared spectral regions.
- 2. Black paints with organic binders are not recommended for optical instruments for high vacuum applications due to their high total mass loss and condensable condensed material %. The black electroless nickel being an inorganic coating with negligible weight loss in vacuum conditions is an ideal choice in such applications.

ISRO is willing to offer the technology of Ultra High Absorber Black Electroless Nickel Plating to eligible interested parties. Interested entrepreneurs / industries are requested to contact the address given below with all relevant particulars regarding their line of current activity, infrastructure available, market assessment of the product, financial arrangements made, turn over and sales of their products for the past years and a copy of their latest annual report.

FOR FURTHER DETAILS, PLEASE CONTACT:

Group Director Program Planning & Evaluation Group (PPEG) **ISRO Satellite Centre (ISAC)** PB No. 1795, Old Airport Road, Vimanapura PO Bangalore - 560 017 Ph: 080-2508 2141 e-mail: hebbar@isac.gov.in

THERMAL CONTROL COATING

Indian Space Research Organisation at its Space Applications Centre (SAC), Ahmedabad, has qualified the process of thermal control coating for spacecraft subsystem component made of materials such as Anodized Aluminium, Chromated Aluminium, Bare Aluminium, Electroless Nickel Plated Invar, Bare Invar, Silver Plated Aluminium, Chromated Magnesium, Black Anodic Coated Magnesium etc for use in space industry. Black paint is utilized on the interior of spacecraft to facilitate radiant heat transfer among internal components. The process will find wide commercial and special applications.

Commonly used space qualified paints are available in two colours - Black & White. The Thermo Optical properties of Thermal Control Coatings are given below:

COATING TYPE	EMISSIVITY (E)	SOLAR ABSORPTIVE (A)	A/E
Black	0.90	0.90	1.00
White	0.85	0.20	0.23

50 to 70 micron

SPECIFICATIONS

Total Mass Loss (TML):	≤1.0 %
Collected Volatile Condensable	
Material (CVCM):	≤0.1 %
Colour:	Black & White
Appearance:	Flat / Matt Finish

• Dry Film Thickness (DFT):

PRE REQUISITES

- 1. Industry must possess painting know how.
- 2. Conditioned thermal painting booth(s) and painting guns.

ISRO is willing to offer the technology to eligible interested parties. Interested entrepreneurs / industries are requested to contact the address given below with all relevant particulars regarding their line of current activity, infrastructure available, market assessment of the technology, financial arrangements made, turn over and sales of their products for the past years and a copy of their latest annual report.

FOR FURTHER DETAILS, PLEASE CONTACT:

Head

Technology Transfer & Industry Interface Division (TTID) Planning & Projects Group (PPG) Space Applications Centre (SAC), ISRO



Ambawadi Vistar P0 Ahmedabad - 380 015 Ph: 079-2691 3322; Fax: 079 - 2691 5817 e-mail: ttid@sac.isro.gov.in

SILVER PLATING ON WAVEGUIDES

Indian Space Research Organisation at its Space Applications Centre (SAC), Ahmedabad, has developed a process to carry out silver plating in aluminium waveguide. It is an intricate process considering the complexity and shape of the component. Uniform deposition (inside & outside) throughout the component is achieved using this process.

Silver plated waveguides are used in communication payloads of satellites. Silver plating on Aluminium is required to obtain good RF performance. Silver provides the best known electrical conductivity and is solderable.



SPECIFICATIONS:

Electroless Nickel Plating Thickness	6	to	8 micr	ons
Silver Plating Thickness	5	to	8 micr	ons

PRE REQUISITES:

- 1. Industry must possess basic electroplating know how.
- Industry must possess electroplating set up including baths, anodes, power supply etc.

ISRO is willing to offer the technology to eligible interested parties. Interested entrepreneurs / industries are requested to contact the address given below with all relevant particulars regarding their line of current activity, infrastructure available, market assessment of the technology, financial arrangements made, turn over and sales of their products for the past years and a copy of their latest annual report.

FOR FURTHER DETAILS, PLEASE CONTACT:

Head Technology Transfer & Industry Interface Division (TTID) Planning & Projects Group (PPG) Space Applications Centre (SAC), ISRO Ambawadi Vistar PO Ahmedabad – 380 015 Ph: 079-2691 3322; Fax: 079 - 2691 5817 e-mail: ttid@sac.isro.gov.in

ISSUED BY The Director, TT&IC, ISRO HQ, Antariksh Bhavan, New BEL Road, Bangalore – 560 094 www.isro.gov.in/ttg