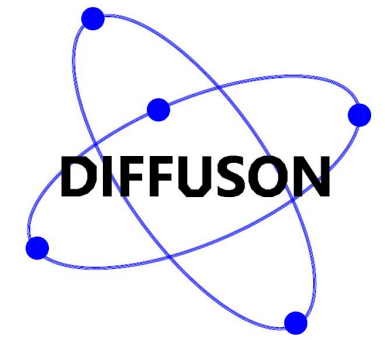


Pitch for Aerospace applications



DIFFUSON



Diffuson Coatech LLP

Surface Engineering and Tribology solutions
PI write to ceo@diffuson.in



ISO 14001:2015 pending
Meets NADCAP spec

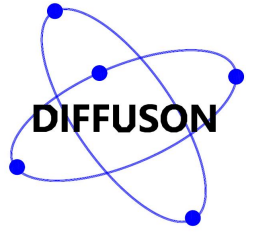
Version: 2, i3 | Prepared By: SCA | Dt. 15-04-2024

Contains Boronizing, Aluminizing, Nickel Boron and New technologies developed

SURFACE
Engineers



About Us



Diffuson Coatech LLP is a deeptech company focusing on providing coatings and diffusions for wear, oxidation and corrosion resistance, to enhance the product durability.

Our mission

“Diffison Coatech aims to provide high quality solutions in surface engineering with the integration of innovative technology and scientific research to meet the expectations of National and Global industries.”

Our company certifications



DIPP57276

Team profile



Mr. SC. Atul, CEO

*B.E. (Mechanical Engg.)
M.S. (Surface Engineering)*

Surface Engineer with 6+ years of R&D experience in Tribology & corrosion



Mr. Chandra Sekar, COO

MIE (Mechanical Engg.)

Serial Entrepreneur with 20+ years of Industrial and Business experience



- **50% of our core team members hold PhDs**
- Seasoned team with 100+ years of R&D experience

Our key departments

Quality Assurance

Standardization

Research & Development

Production planning

High Temp. Engg cell

What do we offer

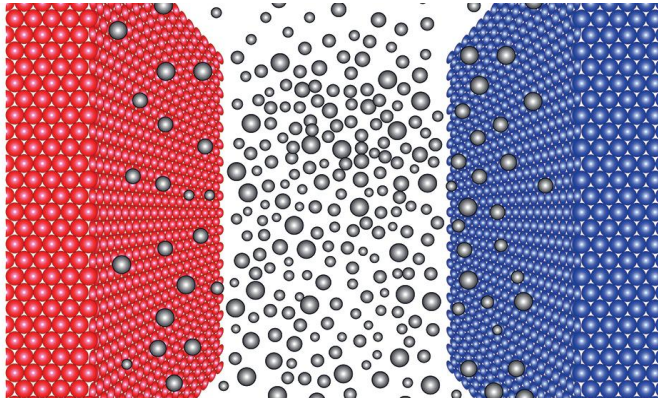
Our USP

- Innovation backed company with strong research background
- Over 100 years of combined R&D experience
- Multiple field trials
- Minimum 304% increase in durability compared to standard components & 650% Increase in durability Typ.
- 100% OTD & 100% QCP produced since inception.

Validation and Academic relations

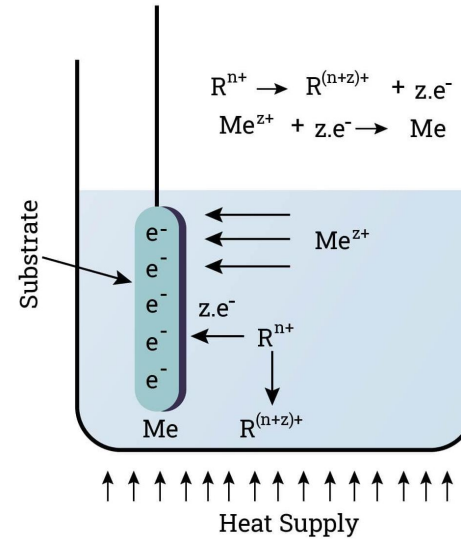


How do we offer it



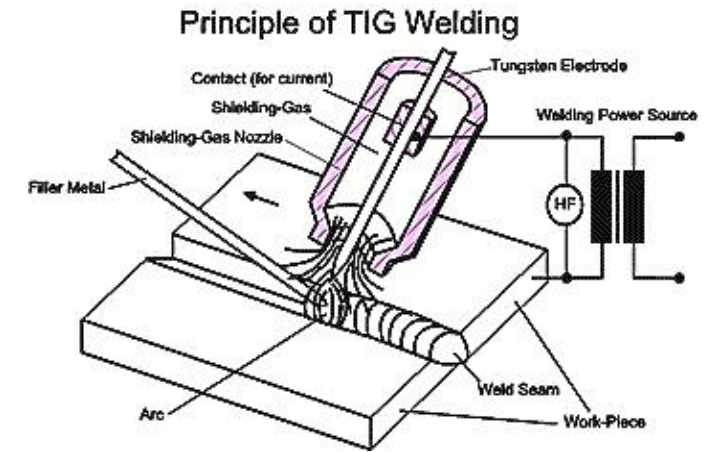
Diffusion Coatings

- Boronizing
- Chromizing
- Aluminizing
- Vanadizing
- Zinc Diffusion galvanizing



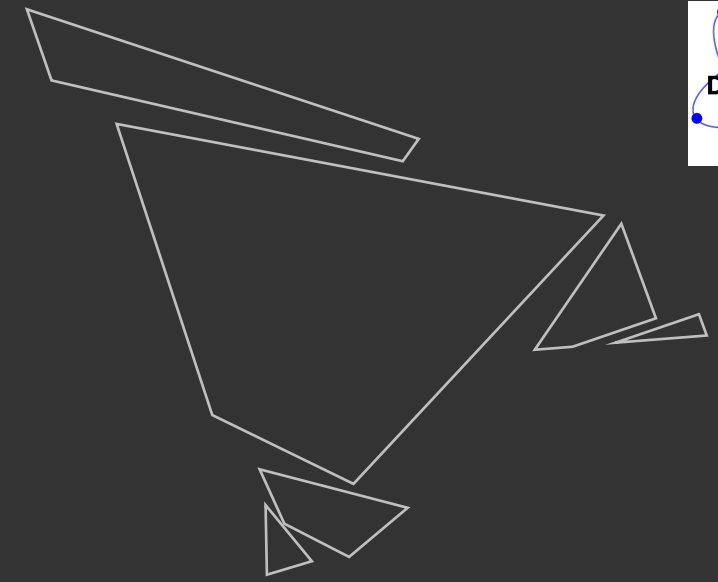
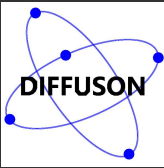
Platings Coatings

- Electroless nickel boron
 - (Type 1 / Type 2 AMS & ASTM)
- NiForm (IP to replace Hard chrome)



Fusion based Coatings

- Cobalt #6 as per AWS A5 21



Novel Boronizing

Boronizing on Inconel 718 for dimensional deviations, surface hardness and Case depth
(Tests conducted for engine application in 2020)

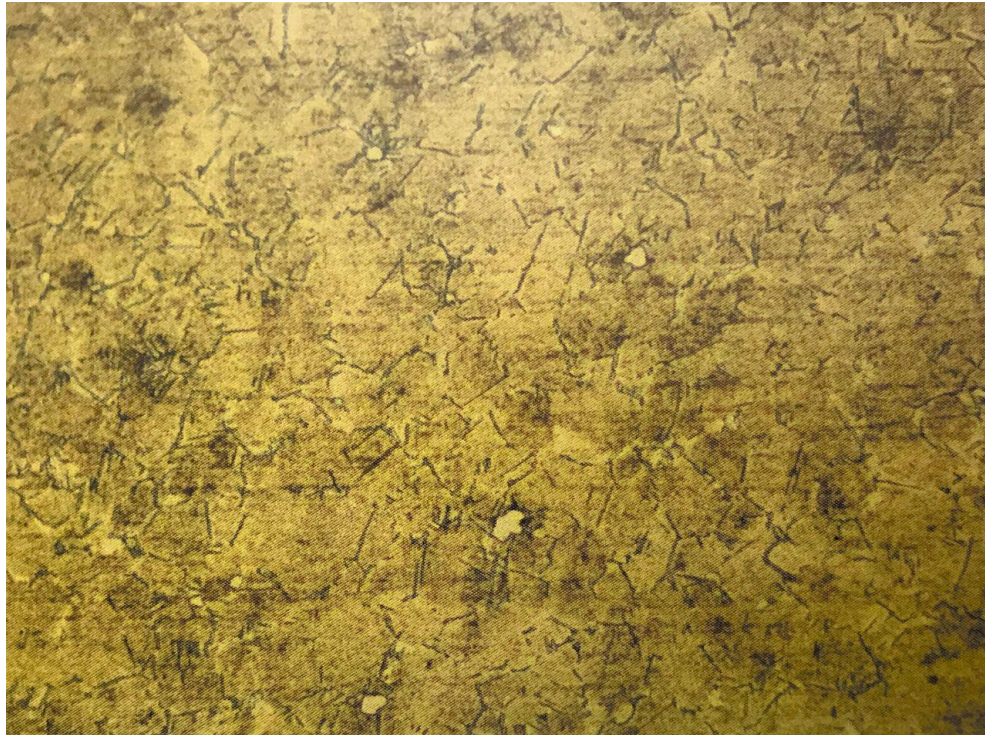


Specification as per leading commercial jet manufacturer

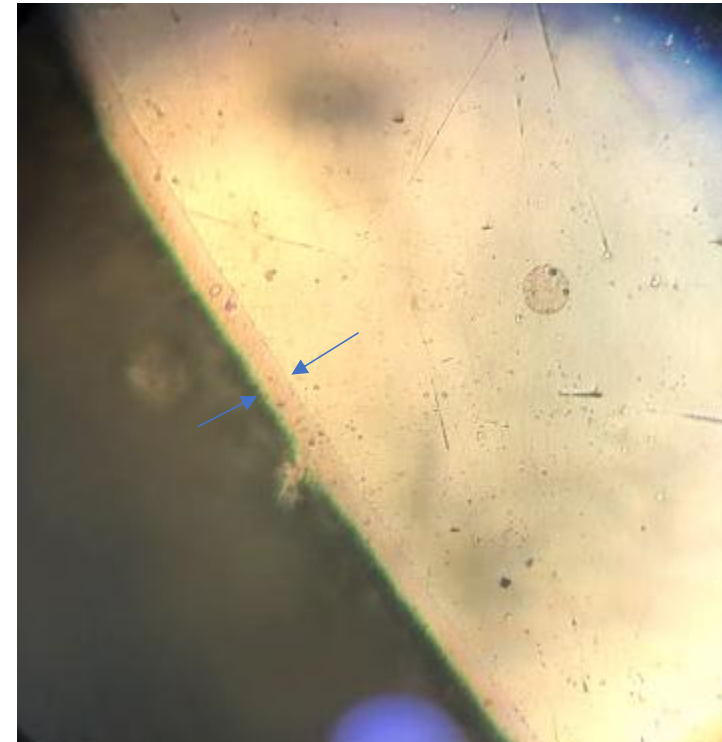
Material: Centrifugal cast Inconel 718, Section thickness: 88 mm

S. No.	Specification	Observed		
1.	Heating Equipment within ± 25 °F (± 14 °C)	+6/-9 °C (TUS as per AMS2750)		
2.	Thermal Cycle <20 Hours, <771 °C	Temperature spiked to 770 °C for initial few minutes until the PID could learn the load. Max 9 Hours		
3.	Hardness >1400 HV	Hardness 1684 – 1846 HV0.1		
4.	Boride coating thickness 0.0005-0.0015 in (0.013- 0.038 mm)	0.025-0.036 mm 0.0011 Inch average		
5.	Design Consideration “Boride coating can result in dimensional changes and distortion as the parts are exposed to a high temperature during the coating process.”	Initial (mm)	Post boronizing (mm)	Δ (mm)
		10.068	10.087	0.019
		10.076	10.091	0.015
		10.073	10.086	0.013

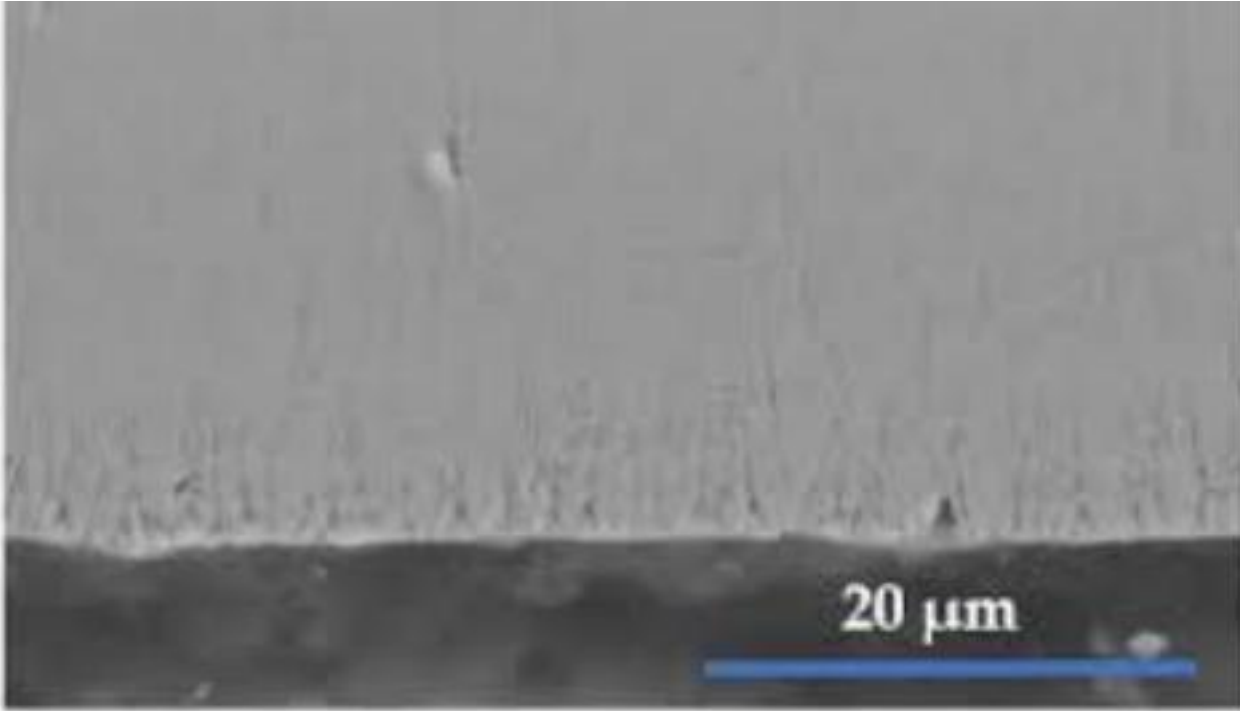
Metallographic observations



Core microstructure at 500X optical magnification after Boronizing



200 X Optical Magnification
Observation: 25-26 μm Layer



ENCoB Coating

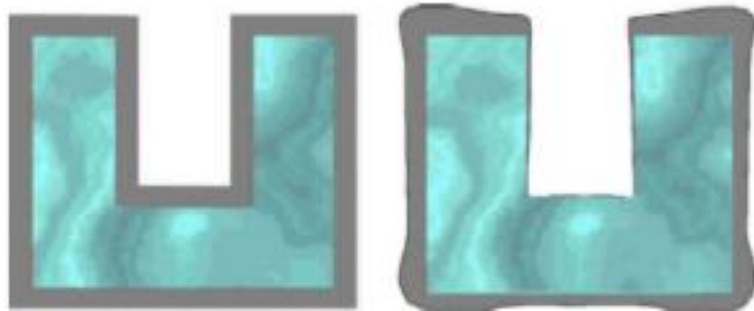
An high performance autocatalytic reduction coating of hard and inert metals produced below R_c temperature.

Optimized environment friendly Electroless plating technology for

- Nickel
- Nickel Boron
- Cobalt
- Cobalt Boron

Chemical and mechanical performance

Coating uniformity



Electroless coated part

Electrolytic coated part

Diffuson Coatech provides non-electrolytic surface modifications such as **EnCoB electroless Nickel-Boron, Cobalt-Boron and Nickel-Vanadium coatings**

Our coatings provide **better corrosion resistance compared to electroplating**



Cross section of EL Nickel Boron after **380 hours** of salt spray corrosion test

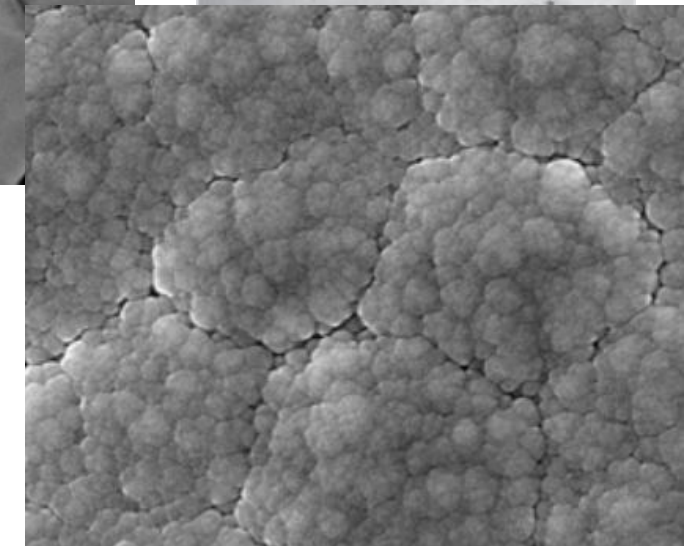
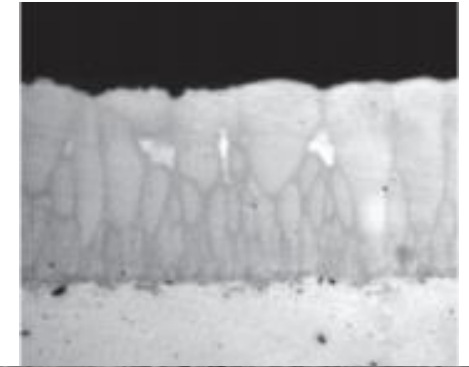
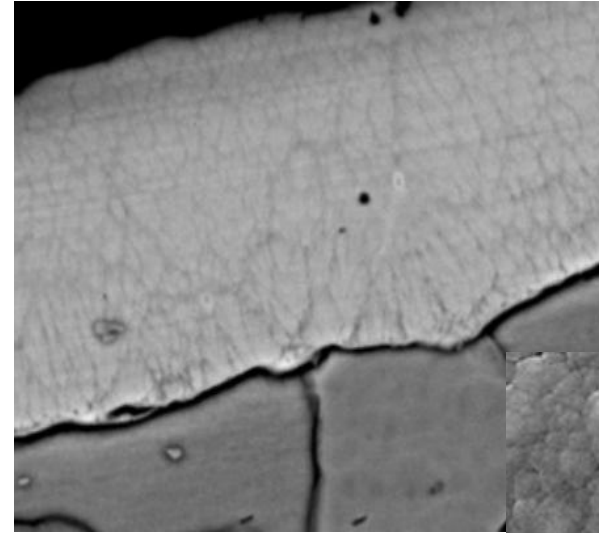
Rotating beam Fatigue test $N = 10^7$

Material	AISI 1040
Nature of coating	Fatigue test result (MPa)
Uncoated	355
Hard Chrome	230
Electroless Nickel Boron	270

Electroless nickel Boron

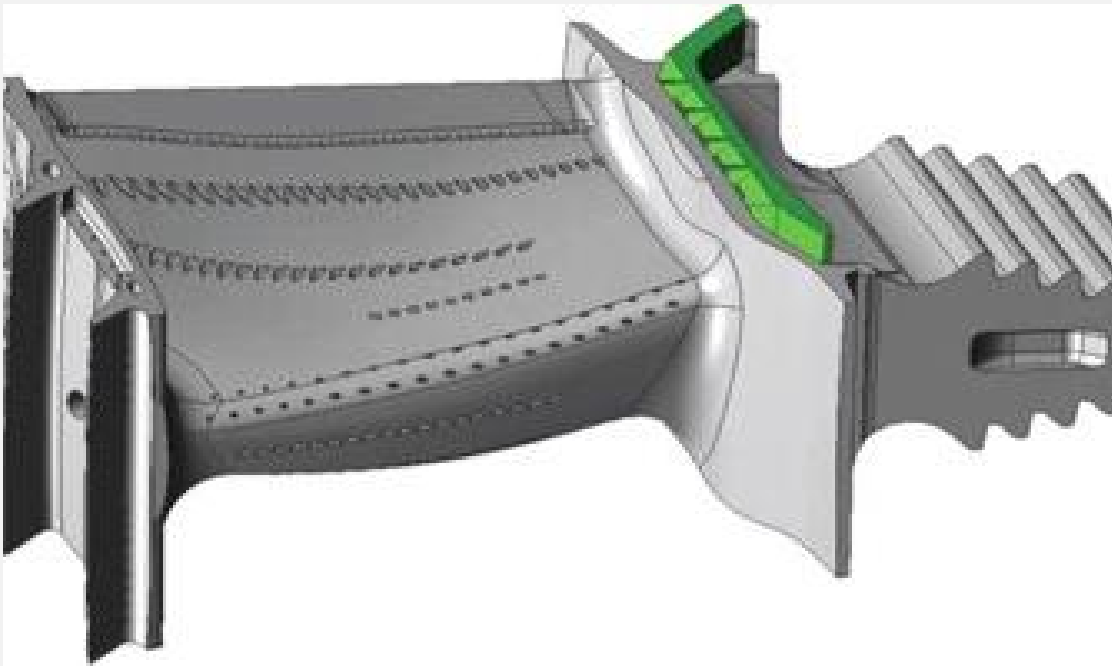
In addition to its excellent corrosion and wear resistance capabilities, nickel boron plating provides the following:

- **AMS 2399 compatible**
- Eco-friendly alternate for hard chrome
- Improved ductility over Hard Chrome plating ($\rho = 8.25$)
- No risk of hydrogen embrittlement
- Natural thermal conductivity
- Grinding after plating not required because of uniform plating thickness
- **No thallium formula for Type II coating**
- **Thallium based formula is also available Type I**



Typical requirement for Electroless nickel Boron as per AMS/SAE

Property	Requirement	Observed
Coating required	Electroless nickel boron	Nickel 94.6 % Boron 4.9 % Other 0.4%
Coating type	AMS2433 Type 2	No Thallium used. Meets ASM 2433 Type 2 Spec.
Hardness	As plated (Not specified)	440 HV0.1
	Heat treated (Not specified)	1025 HV0.1
Coating thickness	0.0008 - 0.0012 Inch Or 20-30 μm	24-28 μm



Diffusion Aluminizing and AlSiB coating

Thermal Diffusion based high temperature oxidation and
wear resistant coating



Diffusion Aluminization Properties



Produces NiAl, FeAl, CoAl, TiAl depending on the composition of the base metal.

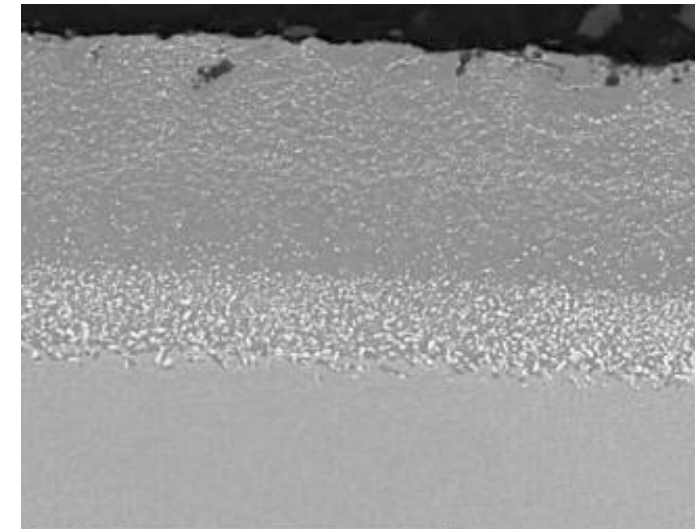
- Sulfidation resistance - steel protection from H₂S, SO₂, SO₃ attack
- Oxidation resistance - stable aluminum oxide film formed
- Carburization resistance - prevents carbon diffusion into base metal

Mechanical properties

- Hardness: 900-1100 HV0.1 typically and up to 1800 HV in special cases.
- Coating thickness: 15-100 Microns
- Process temperature: 700-950 °C

Application

- Oil and gas tubes and pipes
- Gas turbine components



50 μm

AlSiB coating

Typical requirement for **Aluminizing**

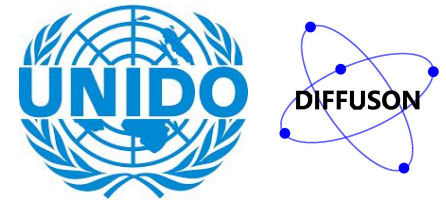
Typical aerospace requirement for high temperature applications

Property	Required	Observed
Coating thickness	25.4 - 63.5 μm	51 – 61 μm (Optical)
Aluminum content	24 – 29 %	28 % (EPMA)
Hardness	Not specified	934-961 HV0.1

Carbon and GHG emission savings.

Usage of MetaBoid technology reduces carbon emission by 66% typ.

GHG emission saved in Kgs mentioned below photo.



Glass mould
1875 KG of GHG



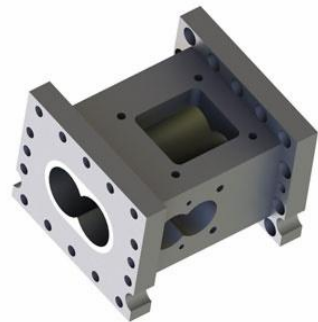
Control Valve
2,53,125 KG of GHG



Pump used in Paper industry
19,690 KG of GHG



API 6D Ball valve
5,160 KG of GHG



Extrusion barrel
24,000 KG of GHG

Industry	Life enhancement	GHG saved per Kg of steel
Glass Bottle	4.8X	1800 Kg
Control valve	2.5X from Stellite	940 to 1500 Kg
Paper industry	3.51X	1315 Kg
Plastic industry	4.1 X	1500 Kg

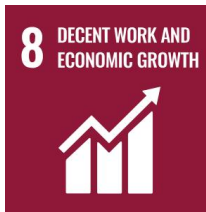
Target 6.4
Water use
efficiency



Target 7.3
energy
efficiency



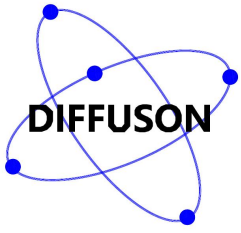
8.2 Innovate &
8.3 resource
efficiency



12.2 use of
natural resource
& 12.4 Chemical
waste



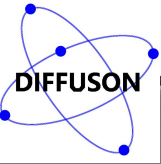
Source: <https://carbonfund.org/calculation-methods/>
Rounded off to nearest 5



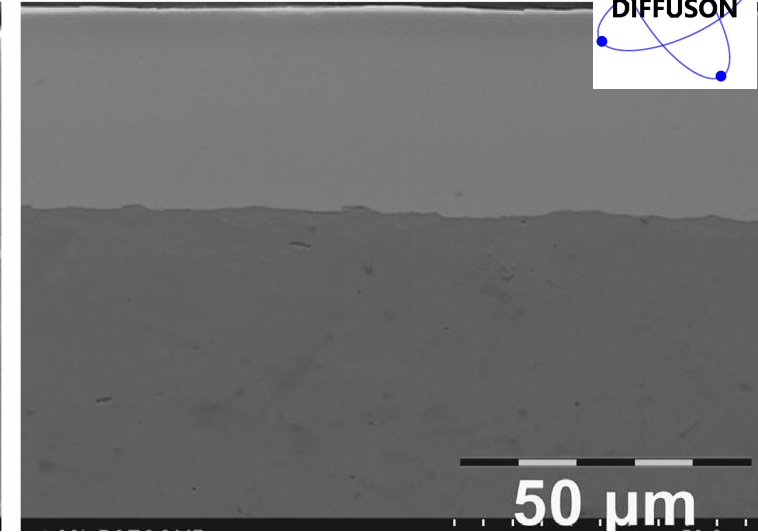
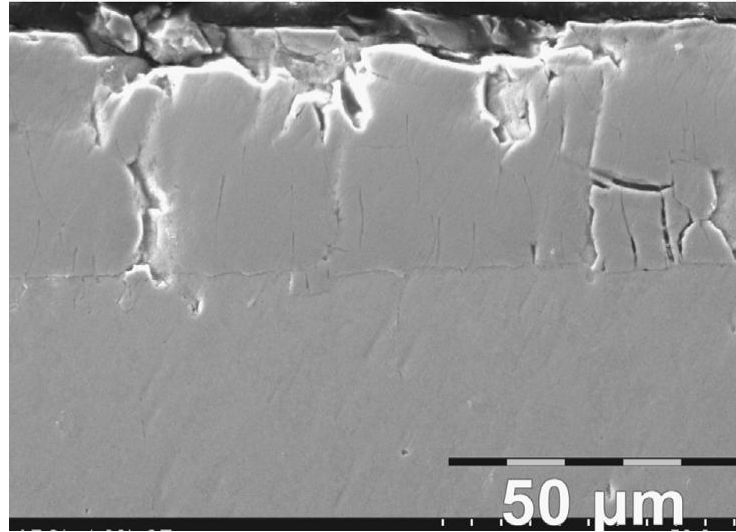
Proprietary technologies developed

Technology for application Aerospace + Oil & Gas

NiForm Coating



Highly corrosion and abrasion resistant coating to replace hard chrome plating in sensitive applications



SEM images taken after ASTM G99 based Sliding wear test at 29N, 3000 m, slow speed sliding, MoM, RT/RH condition.

- Coating of Nickel Tungstate on most conductive alloy.
- Surface hardness of 1100 - 1600 HV depending on application.
- Highly corrosion resistant with 600 Hours of salt spray as per ASTM B117
- Maintains high hardness even at 400 °C

Corrosion resistance up to 3000 NSS hours, 720 Acidic Hours

Produces stable Iron-Zinc compounds on the surface

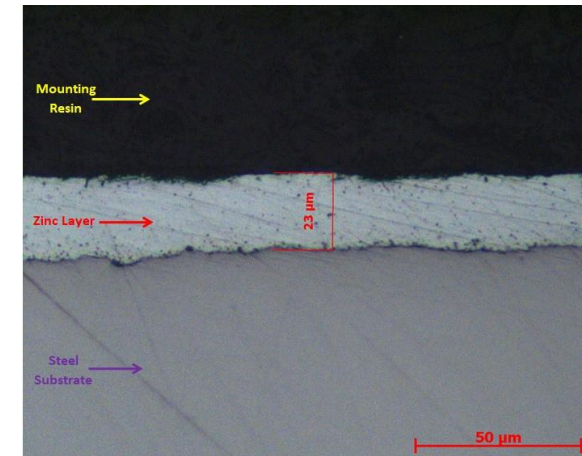
- Replacement for hot dip galvanizing
- Uniform coating thickness – No touch ups or no drips
- Environment friendly process – No acids used, no solid/liquid/gas waste

Functional properties

- Compressive strength: ASTM F 606 (5/8"): 8600 Kg
- Bonding strength: ANSI C135.80 – 2012: no cracks or flakes at 180°
- Corrosion resistance: ASTB B117: 5% white rust at 3000 NSS Hours
- Minor abrasion resistance due to increased surface hardness 450 HV
- Non galling, Low temperature process, No Hydrogen embrittlement

Application

- High Strength Fasteners, railway parts
- Will replace cadmium plating for galling application
- Marine structures and Naval structures



Optical Microscopy
500X



Quality Management System



Novo Star Management Systems Solutions India Pvt Ltd

Is accredited under the control of the AQMS standard certification scheme (ICOP). The method of operation for quality certification is defined in the Novo Star Management Systems Solutions India Pvt Ltd General Terms And Conditions For Quality And Environmental Management Systems Certifications.

This is to certify that



DIFFUSON COATECH LLP

NO. 25, SIDCO INDUSTRIAL ESTATE, THANEER KULAM, THIRUVALLUR – 602 025, TAMIL NADU, INDIA

has implemented and maintains a Quality Management System for its:

Scope:

PROVISION OF SURFACE MODIFICATION SERVICES INCLUDING BORONIZING THERMAL DIFFUSION COATING

Through an audit, performed in accordance with the requirements of AS 9104/1 issued 2012-01, and including the implementation, meets the requirements of the standard:

AS 9100:2016

(Based on and including ISO 9001:2015)

Quality Management Systems – Requirements for Aviation, Space and Defence Organisation.

The file that forms the basis of this certificate:

Certification Structure	: Single
Date of Initial Issue	: May 25, 2023
Date of Re-issue	: Not Applicable
Date of Certification Expiry	: May 24, 2026
Certificate Number	: 0523-0526-CN AS 122



Director

Note: Please verify current validity of certificate from Novo Star Management Systems Solutions India Pvt. Ltd., No. 13, 2nd Floor, Shesha Sadan, Shiridi Saibaba Mandir Road, Cambridge Layout, Ulsoor, Bangalore – 560008, Karnataka, India. www.novostar.in Integral publication of this certificate is allowed.

Novo Star Proprietary

Page 1 of 1



Novo Star Management Systems Solutions India Pvt Ltd

follows the method of operation for quality certification and is defined in the Novo Star Management Systems Solutions India Pvt Ltd General Terms And Conditions For Quality And Environmental Management Systems Certifications

This is to certify that



DIFFUSON COATECH LLP

NO. 25, SIDCO INDUSTRIAL ESTATE, THANEER KULAM, THIRUVALLUR – 602 025, TAMIL NADU, INDIA

has implemented and maintains a Quality Management System for its:

Scope:

PROVISION OF SURFACE MODIFICATION SERVICES INCLUDING BORONIZING THERMAL DIFFUSION COATING

Which was audited and found to be in compliance according to the Standard:

ISO 9001:2015

Certification Structure	: Single
Date of Initial Issue	: May 25, 2023
Date of Re-issue	: Not Applicable
Date of Certification Expiry	: May 24, 2026
Certificate Number	: 0523-0526-CN QMS 122



Director

Note: Please verify current validity of certificate from Novo Star Management Systems Solutions India Pvt. Ltd., No. 13, 2nd Floor, Shesha Sadan, Shiridi Saibaba Mandir Road, Cambridge Layout, Ulsoor, Bangalore – 560008, Karnataka, India. www.novostar.in Integral publication of this certificate is allowed.

Novo Star Proprietary

Page 1 of 1



सूक्ष्म, लघु और मध्यम उद्यम मंत्रालय
MINISTRY OF
MICRO, SMALL &
MEDIUM ENTERPRISES



CERTIFICATE

ZED BRONZE

under MSME Sustainable (ZED) Certification Scheme
awarded to

Diffuson Coatech

UNIT NAME

Flat No:- No. 25, Building:- SIDCO Industrial Estate, Road/Street:- SIDCO Road,
Village/Town:- Thaneer Kulam, Block:- 1, City:- Tiruvallur, THIRUVALLUR, TAMIL NADU-
602025

UNIT ADDRESS

**25-Manufacture of fabricated metal products, except machinery and
equipment**

CODE (AS PER NIC-2008)

UDYAM-TN-24-0004787

UDYAM REGISTRATION NUMBER

Issued on :
August 10, 2023

Certificate Validity :
Three years from the date of issue

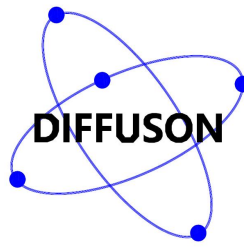
Certificate No. 10082023_068951



This Certificate has been awarded after fulfilling all relevant requirements as laid down in the MSME Sustainable (ZED) Certification Scheme Guidelines for this Certification Level. Award of this Certificate does not substitute any legal requirement needed for setting up or operating an MSME Unit.

EMS certification is pending

DIFFUSON
Coatech LLP



Thank You



Kindly mail to d.coatech@gmail.com or
ceo@diffuson.in
+91 7397 2969 15
www.diffuson.in

EMS 14001 by June 2024



Version: 4.0 | Prepared By: SCA | Dt. 09-04-2024