



# **NewSkin: Innovation Eco-system to Accelerate the Industrial Uptake of Advanced Surface Nano-Technologies.**

**Value Propositions: On automatized controlled deposition of nano-enhanced coatings for multisectoral applications**

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# NewSkin Range of Services To Be Provided And Key Target Industries:

Steel Construction

Ceramics

Water Treatments

Transport

Renewable Energy

Medical Device

Photonics



Commercialization of nano-enabled Consumer products with new functionalities



### Design of Solutions

Technology Transfer  
High Performance  
Added Value  
Advanced Features

### Prototyping

Enhanced  
Continuous  
Mass Production  
Processes

### Performance Evaluation

Replicating highly  
demanding end use  
conditions

### Benefits Quantification

LCA Approach  
Economic  
Social  
Environmental  
Regulatory

### Industrial Uptake and Route to Market Support

Value Chains  
Funding  
Networking  
Regulatory Issues  
Nanosafety and  
Security

### Commercialisation of Nano-enabled Consumer Products

New Functionalities  
General Industry Focus:  
Steel Construction  
Ceramics  
Water Treatments  
Transport  
Renewable Energy  
Medical Device  
Photonics



# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings



- Initial case-studies using this NewSkin OITB facility will provide a first showcase of functional coatings
- Others have the chance to apply for access to NewSkin OITB facilities through 4 open calls 2022-24
- NewSkin OITB upscaling facility for this value proposition include:
  - ✓ *Automated atmospheric pressure plasma jet for surface pre-treatment*
  - ✓ *Liquid and powder paint booths upgraded with an automatized spray, nanosafety assessment and IR dry/curing system*



# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings



**Target 1:** initial demonstrative case study on nano-enhanced functional coatings with NewSkin partners will provide a first showcase for:

- Components protection under combined stresses in harsh environments and aggressive and industrial atmospheres
  - ✓ Nano-enabled organic coatings: anticorrosive, antifouling, anti-ice, intumescent.
  - ✓ Nano-enabled inorganic coatings: antisoiling/anti-reflective, antimicrobial/antifouling, antifouling/anti-ice
- Manufacturing of nano-enabled surfaces by mass production processes
  - ✓ Surface finishing of nano-structured compounds by liquid and powder coatings



# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings



**Target 2:** new value propositions for other case studies based on durable functional coatings

- VP1: Automated atmospheric pressure plasma (APP) jet for surface pre-treatment
- VP2: Liquid paint booths upgraded with an automatized spray, nanosafety assessment and IR dry/curing system
- VP3: Powder paint booth upgraded with an automatized spray, nanosafety assessment and IR dry/curing system



# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings



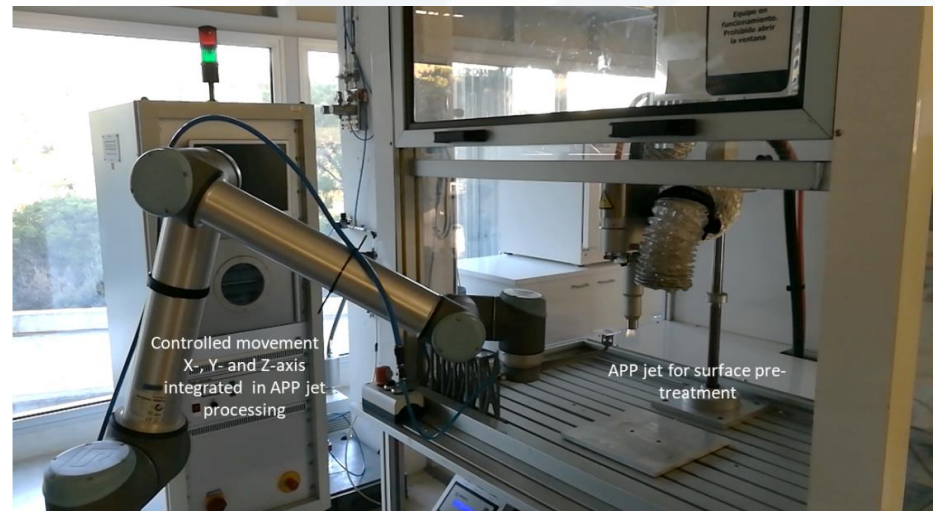
- Value proposition 1: Automated APP jet for surface pre-treatment



APP jet for surface pre-treatment

- ✓ *Integrated automatized system with controlled X, Y, Z-axis movement for improving reproducibility of surface pre-treatments and optimize operational parameters before industrial up-scaling*

- ✓ Rotative nozzle technology
- ✓ Low frequency generator: 19-23 kHz
- ✓ Adjustable plasma cycles: up to 100%
- ✓ Discharge distances: 5-25 mm
- ✓ Processing speed: 0,1-37 m/min
- ✓ Surface treatment of 2D or 3D materials





# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings



- Value proposition 1: Automated APP jet for surface pre-treatment

## Services offered:

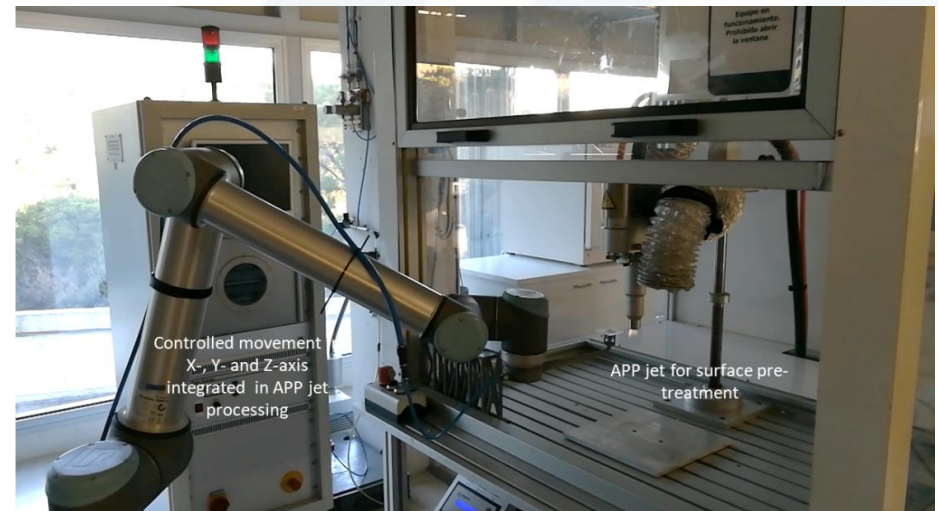
- ✓ Optimizing APP processing parameters:
  - Nozzle type: static, 100mm-rotative, 500mm-rotative
  - Distance APP discharge - 2D/3D objects
  - Processing speed
  - Frequency
  - Plasma cycles
- ✓ Optimizing automatized process
  - Scanning of 2D/3D objects
  - Processing steps (e.g. sampling, stop-start)
- ✓ Reproducibility of APP processing:
  - Measuring temperature and relative humidity

## Multisectoral applications:

- ✓ Surface cleaning
- ✓ Surface modification



APP jet for surface pre-treatment



# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings

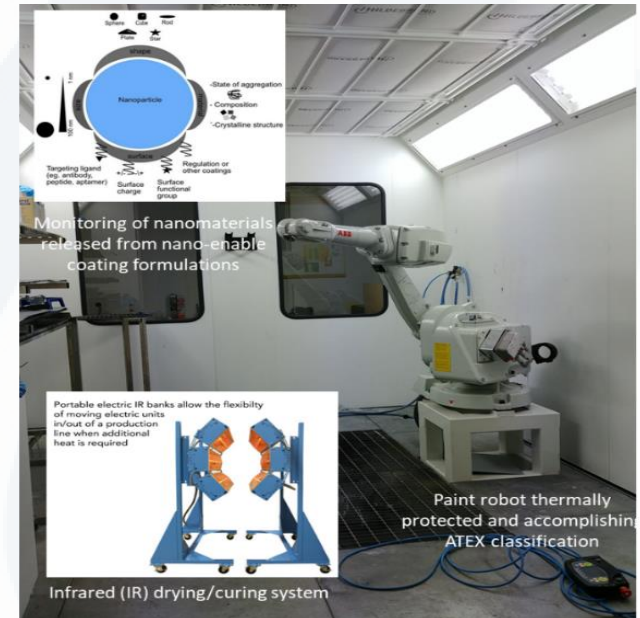


- Value proposition 2: Liquid paint booth upgraded with an automatized spray, nanosafety assessment and IR dry/curing system

- ✓ Vertical flow 3m x 4m liquid paint booth
- ✓ Temperature-time control for paint-drying-cooling steps
- ✓ Paint box for preparation of WB, SB, 100% solid paints
- ✓ Spray painting process is ATEX compliant
- ✓ *Integrated automatized infrared (IR) system as environmentally friendly alternative to conventional thermal drying/curing systems*
- ✓ *Integrated assessment of nanosafety of nano-enable coating processing for potential nanomaterials in air inside and outside the liquid paint booth.*



Liquid paint booth





# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings



- Value proposition 2: Liquid paint booth upgraded with an automatized spray, nanosafety assessment and IR dry/curing system

## Services offered:

### ✓ Optimizing automatized liquid paint processing parameters:

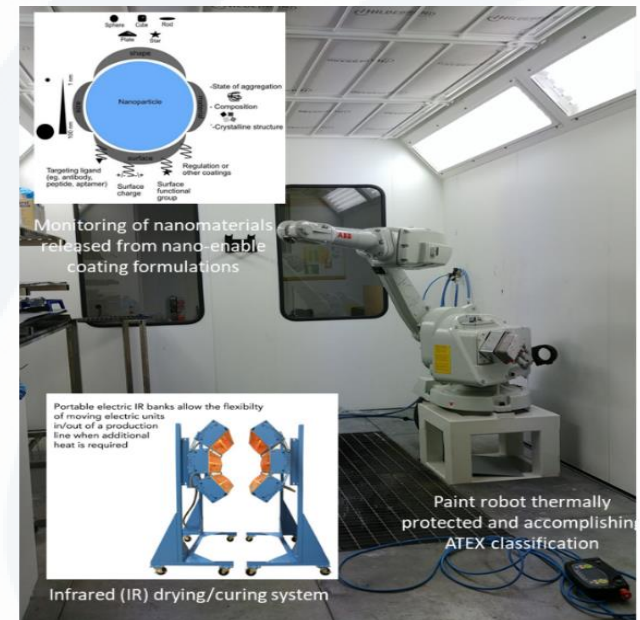
- Airless and aerographic spray guns for low/viscosity, primers/topcoats, SB/WB/100% solids
- Nozzle type
- Coating angle
- Coating distance
- Atomizing flow-rate
- Scanning of 2D/3D objects
- Processing steps (e.g. sampling, stop-start)
- IR drying/curing
- Nanosafety assessment



Liquid paint booth

### ✓ Reproducibility of liquid paint processing:

- Controlling temperature and measuring relative humidity



Infrared (IR) drying/curing system



# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings



- Value proposition 3: Powder paint booth upgraded with an automatized spray, nanosafety assessment and IR dry/curing system

- ✓ Batch 1,0m x 1,5m powder paint booth
- ✓ High voltage generator: 100 kV
- ✓ High Density Low Velocity (HDLV) tech.
- ✓ 11,3 L powder feed hopper
- ✓ Convenient powder recovery
- ✓ Application performance at current levels below 5  $\mu$ A
- ✓ Spray painting process is ATEX compliant
- ✓ *Integrated automatized infrared (IR) system as environmentally friendly alternative to conventional thermal drying/curing systems*
- ✓ *Integrated assessment of nanosafety of nano-enable coating processing for potential nanomaterials in air inside and outside the powder paint booth.*



Powder spray system



# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings



- Value proposition 3: Powder paint booth upgraded with an automatized spray, nanosafety assessment and IR dry/curing system

## Services offered:

- ✓ Optimizing automatized powder paint processing parameters:

- Powder output < 450 g/min
- Production rate < 3 m<sup>2</sup>/min
- Powder recovery: 100%
- Electrostatic discharge (e.g. 50-100 kV, 15-50 mA)
- Nozzle type: planar, conical and crossed; several deflectors available
- Coating angle and distance
- Scanning of 2D/3D objects
- Processing steps (e.g. sampling, stop-start)
- IR drying/curing
- Nanosafety assessment



Powder spray system

- ✓ Reproducibility of powder paint processing:

- Controlling temperature and measuring relative humidity



# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings



Applications	Substrates	Markets
<b>Anticorrosive coatings</b>	Metals, building materials	Manufacturing industry, H <sub>2</sub> tanks, energy generation and storage, building and infrastructures, water treatment/storage and distribution, transport
<b>Antisoiling coatings</b>	Solar glass; tempered, laminated glass; optical polymers (e.g. PMMA, PC)	Solar energy (PV, CSP), glass in building applications (e.g. windows, glass walls) , transport
<b>Antimicrobial / antiviral coatings</b>	Metals, polymers and polymeric composites	Public transport (e.g. underground, bus, tram, car and bike sharing, etc.), public installations (e.g. handles, pushbuttons), fuel tanks, pipes, pumps, turbines, food-contact surfaces
<b>Flame retardant coatings</b>	Metals, polymers, composites, wood	Building and infrastructures, transport
<b>Optical coatings</b>	Glass and optical polymers (e.g. PMMA, PC, PS, PDMS, PU)	Energy generation (PV, PBRs), energy efficient buildings, sensors, transport
<b>Anti-ice coatings</b>	Aluminum and steel, composites	Airplane parts, energy generation and distribution, infrastructures
<b>Abrasion resistant coatings</b>	Metals, ceramics	Pavements, turbines, engines



# NewSkin Value Proposition: Automatized Controlled Deposition of Nano-Enhanced Coatings



- Target customers across the value chain



- Functional nanomaterials
- Polymeric resins / inorganic matrices
- Functional and inert pigments
- Additives
- Solvents

- Solvent-based paints
- Water-based paints
- High solids paints
- Powder paints

- Application of paints
- Surface treatments such as plasma, corona, fluorination, etc.
- Deposition of thin films

- Building & infrastructures
- Water management
- Energy generation, distribution & storage
- Transport & aerospace
- Sensors
- Engine, turbines and power transmission



# Summary of our services



- Optimization and reproducibility for automated APP surface pre-treatments of 2D/3D objects
- Optimization and reproducibility of automated liquid and powder paint processing
- Validation of energy saving infrared drying/curing processing for water-based and powder paints
- Nanosafety assessment for liquid and powder paints





# References



- Previous research and development projects in LEITAT:

✓ Anticorrosive coatings:



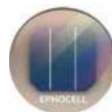
✓ Antisoiling coatings:



✓ Antimicrobial/antivirus:



✓ Optical coatings:



NEFERTITI

✓ Flame retardant:

IGNICOAT



✓ Anti-ice coatings: industrial projects

✓ High abrasion resistant coatings: industrial projects





# Thank you!

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