IZADI-NANO2INDUSTRY

# Nanoreinforced thermoplastic based on masterbatches and inserts with nanotextured surfaces for injection moulds

Speakers

IZADI

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- Mario Ordóñez, MAIER
- Alicia Johansson, NILT

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# **ESTCRATCH Pilot**

### Main features

Technology	Requirements	Sector	IZADI-NANO2INDUSTRY			
			Component	Pilot (TRL7)	Early Adopter	Place
Nano- reinforced thermoplastic (based on master- batches)+ Nanotextured surfaces	Anti-scratch and aesthetic properties	Automotive	B-pillar	ESTCRATCH (Injection moulding)	MAIER	Basque Region (ES)



# **ESTCRATCH Pilot**

Improved materials and innovative injection moulding process for more performing and aesthetics enhanced PMMA plastic parts Selected Component: B-pillar Automotive part

MAJER

#### Nano-improved Nano-improved **Designer of** Developer of the Nanotexturing of the **PMMA** Producer **PMMA** producer **Plasmonic Colors** Inserts and designer of diffractive gratings Cristing Elizetxeg Zina Vuluaa Anders Kristensen Alicia Johansson cristina.elizetxea@tecnalia.com zvuluga@icechim.ro Anders.kristensen@nanotech.dtu.dk alicia@nilt.com tecnalia T mapping Nanostructures Insert **Early Adopter** Patterner Developer Mario Ordonez Renè Hansen Konrad Bienk marord@mtc.maier.es rh@michaellundbech.dk kbi@cemecon.dk MICHAELLUNDBECH IZADI

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# Nanoreinforced Thermoplastic Masterbatches and Anti-Scratch Thermoplastic Nanocompounds

### **Main features**

- Compounding process by extrusion.
- PMMA modified with Polysiloxane and Nanosilica (Patent Application A/00859, 23.10.2017; European Patent pending).
- □ High gloss and deep black colour.
- □ Improved Scratch Resistance (Erichsen 318).





**Preliminary Formulation** 

Nanocompound

Nanobatch

**IZADI** nano2industry PMMA 130117

**PMMA TEC80617** 

PMMA MAI080617

# Nanoreinforced Thermoplastic Masterbatches and Anti-Scratch Thermoplastic Nanocompounds

### **Comparative advantages**

#### Nanomasterbatches

- Easy and uniform dispersion in PMMA matrix.
- Environmentally friendly work conditions instead of pulverous additives.
- □ High level of reinforcement nanoadditives (> 10 %)

#### Nanocompounds

- □ Improvement of scratch resistance (up to 140%).
- High gloss.
- □ High Flowability = High Productivity by injection moulding.
- High-Quality of injected plastic parts.
- Good chemical resistance.
- □ 100% recyclable environmentally friendly.
- □ Very good weather resistance.
- Optimum mechanical properties.
- □ High Heat Deflection Temperature.
- □ Class-A Surface (without painting).





## **Nanotextured Steel Mould Inserts**

### **Bioinspired functional surfaces**





### Combining:

- State-of the art nanostructuration
- High volume manufacturing by Injection moulding







## **Nanotextured Steel Mould Inserts**

### **Diffractive gratings for enhanced aesthetics**







- Diffractive gratings on steel inserts for enhanced aesthetic effect.
- Versatile technology well defined structures down to Ø100 nm.
- High durability >115.000 moulded parts.
- Free form surfaces.





# Anti-Scratch Diffractive/Plasmonic Plastic Parts for the automotive sector – B-pillar

### **Injection Moulding**





# Anti-Scratch Diffractive/Plasmonic Plastic Parts for the automotive sector – B-pillar

### **Main features**

Validation Tests	Results
Scratch Resistance Erichsen 318	ОК
Chemical Resistance	ОК
Colour (Light Cabin) ISO 3664	ОК
Colour Fastness to Rubbing (Crockmeter) ISO 105 F09	ОК
Resistance to immersion in water (Ford Tank)	ОК
Heat Resistance (1h/90ºC)	ОК
Impact Resistance (500g/50cm/23ºC)	ОК
Aesthetics	ОК



# Anti-Scratch Diffractive/Plasmonic Plastic Parts for the automotive sector – B-pillar

### **Comparative advantages**

- Better scratch resistance than commercial grades in the market.
- Addition of nanofillers:
  - Compounding by Extrusion NanoCompound
  - NanoBatch Dilution "In Situ" at injection facilities
- Diffractive / Plasmonic finishes on the surface of the injected plastic parts:
  - **High Gloss**

- In-Mass Color
- Diffractive / Plasmonic Patterns
- Reduction of production phases and costs:
  - Parts made in a single step
  - Decoration and labelling processes can completely be removed.
- Green manufacturing process:
  - Lower energy consumption
  - less transportation
  - Increased recyclability parts consist of fewer materials.
- Nanostructured surfaces developed can also be used to add other functional effects:
  - Anti-reflection
  - Self-cleaning
  - Increased wetting
  - Reduced friction.



# Anti-Scratch Diffractive/Plasmonic Plastic Parts for Other Market Sectors and Customer Segments

### Main application areas



