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TEC STAR
nanofiller consultants and providers

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Safe and sustainable nanomaterials:
contribution of an SME in the EU Nanosafety Cluster

NanoMicex

&

NanoSafePack

NANOMICEX & NanoSafePack are collaborative projects funded by the European Community´s Seventh Framework Programme (FP7/2007 – 2013)

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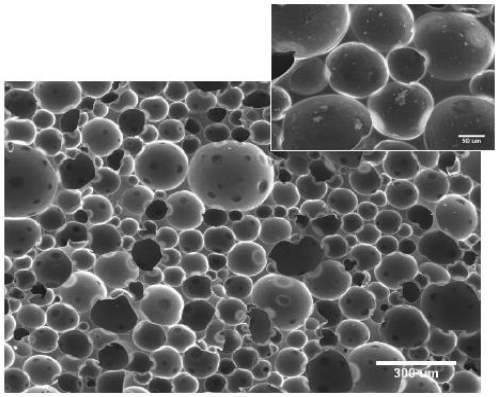
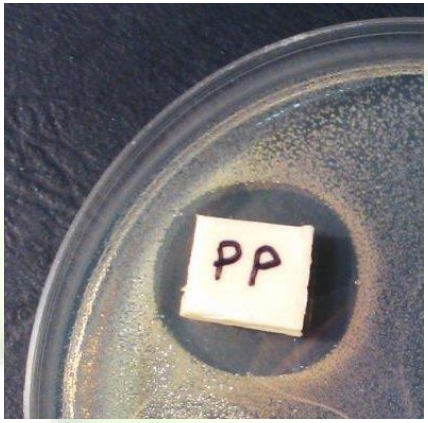
Technical background - ACTIVITIES

POLYMERS



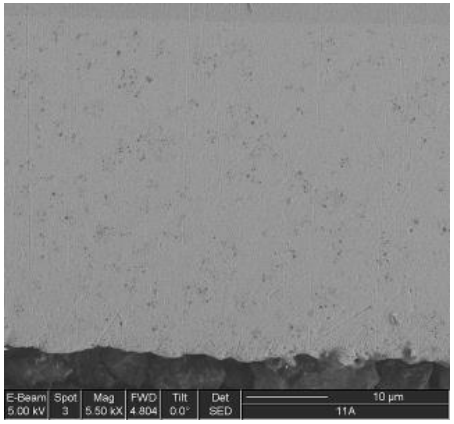
SEM cross section picture of nanocomposite PUR

PAINTS:



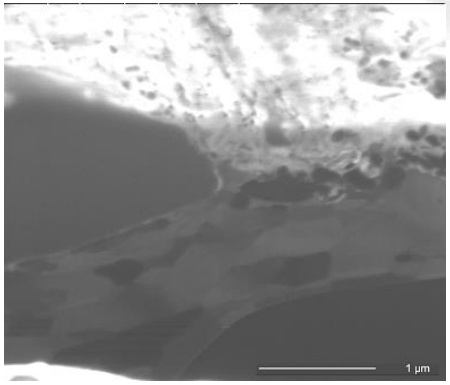
Antibacterial Polypropylene

COATINGS:



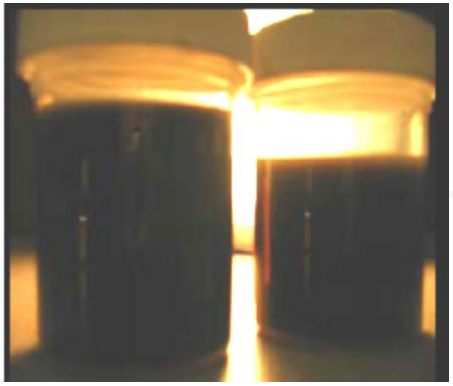
Electrodeposited Nickel + nano

MMNCs



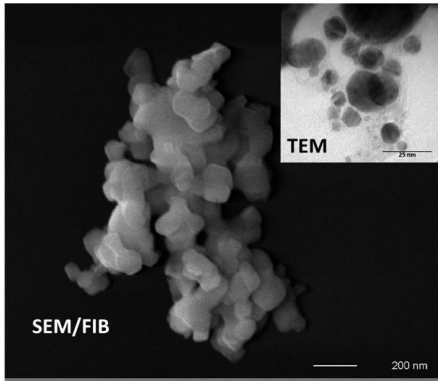
SEM cross section of aluminum alloy MMNC.

OIL LUBRICANT



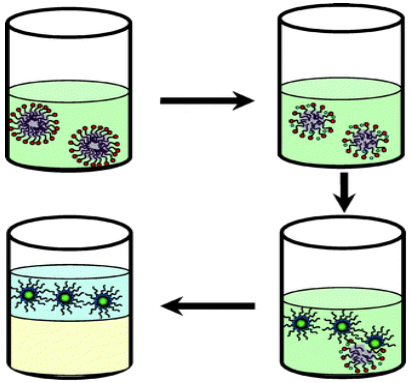
Nanofilled Lubricant Oil

CHARACTERIZATION



SEM/TEM nanoparticle (ZrO_2) characterization

SYNTHESIS



bimetallic nanoparticles Chemical Synthesis

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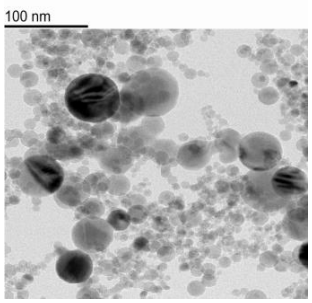
Use of NanoMaterials in the polymer industry

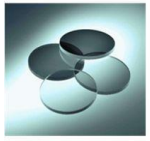
Nanotechnology (in particular the use of Engineering Nanoparticles - ENPs) have a great potential for new applications.

New market opportunities, in particular in the polymer industry

Examples of the Nanotechnology applications:

- ✓ **Pigment related industries**
- ✓ **Packaging industry**.





Paint & Pigment Industry
Printing inks, paints, varnishes, ceramics or artists' colors, are getting always more traction, because the very small size of ENPs confer a wide range of properties to the final products, including thermal stability, scratch resistance or electrical conductivity.

Packaging industry
The use of ENPs improves the volume properties, surface properties, dimensional stability, chemical stability and other functional properties of the reinforced polymers e.g. photocatalytic, optical, electrical and thermal stability

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nanoMICEX

SEVENTH FRAMEWORK PROGRAMME

Mitigation of risk and control of exposure in nanotechnology based inks and pigments

- ✓ INDUSTRY: Inks and paints
- ✓ AIM: to reduce the potential risk of worker's exposure to engineered nanoparticles through the modification of nanoparticle properties with effective surface modifiers
- ✓ RESULTS OBTAINED: to define practical and cost effective risk management strategies in the specific operative conditions of the inks and pigments industry.

Call Identifier: FP7-NMP-2011-SMALL-5

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NANO SAFE PACK

SEVENTH FRAMEWORK PROGRAMME

Safe Handling and Use of Nanoparticles in Packaging

- ✓ INDUSTRY: packaging industry
- ✓ AIM: develop a best practices guide to allow the safe handling and use of nanofillers in the packaging industry
- ✓ RESULTS OBTAINED: to define integrated strategies and best practices to control the exposure in industrial settings, and provide scientific data to minimize and control the release and migration of submicron sized particles from nanomaterials in the market.

Call Identifier: FP7-SME-2011

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Role of Tec Star in these projects

Tec Star is an SME deeply involved in the nanomaterials industry.

TEC Star works on a daily basis with ENMs, mainly on a lab and prototipical scale, but in some case also at an industrial level (100 kg to tons). For this reason NanoSafety is of major interest for Tec Star: including workers exposure, environment exposure, etc.

Tec Star is fully dedicated to Nanoparticles and NanoMaterials R&D, dealing every day with ENMs of different nature, it could represent an example and a quintessential case study for all the laboratories who treat this kind of materials, in order to define and validate Best Practices Guide, Monitoring Devices, Special Protocols, SbD formulations, for this scale of applications.

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Involvement of Tec Star

WP	Short description
1	NPs Characterization
2	NPs Functionalization
3	Tox/Ecotox Analysis
4	Exposure analysis
5	Risk Management
6	LCA
7	Industrial Case
8	Management
9	Dissemination

Main Involvement

Industrial Case Studies (WP7)

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Interest of Tec Star and Expected output from the project

Apply the modifiers in industrial (prototype scale) conditions (7.2)

Implementation of safe exposure scenarios (7.3)

Validation of the nanoproduct quality (7.4)

WP 7

Tec Star Activity

Testing the results of the project in terms of **surface modification of nanoparticles** and **Risk Management Strategy definitions**, within our Industrial Case Studies.
Starting from our Lab scale, up to the industrial scale-up of our customers.

WP 7

i.e. PINTURAS MONTO'

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Interest of Tec Star and Expected output from the project
Future and General Interest of Tec Star on NanoSafety

- Improvement of the **consumer acceptance** of novel technologies aimed at developing new advanced products containing ENMs.

- The **sustainable development** of the nanocomposite industry:
  - A complete analysis of the potential adverse effects of the target nanofillers on the human health and the environment, over the whole life cycle.
  - A compendium of easy to implement procedures to process the nanofillers at industrial scale.
  - A list of proven risk management measures to control and prevent the risk posed by the use of nanofillers, including PPE and engineering controls (LEV, filtration, containment, etc.)

- The **promotion** of the business opportunities:
  - Improving safety of production processes / developing safe and eco-friendly nanocomposites
  - A complete cost benefits analysis considering the cost of the use of nanofillers and the market volume achievable considering the use of nanofillers
  - A complete analysis of the regulatory issues concerning the use of nanofillers for packaging application

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Results, cost, benefits

- **Test and Trials** - Many tests performed in our laboratory and from other laboratories on our materials. Allows a deeper understanding on these new materials, from a technical and performance perspective and from a safety perspective.
- **New potential projects** (*H2020 – in the NanoSafety cluster*) – This is very important for Tec Star, since it has allowed this start-up to enter a basilar EU cluster for NanoSafety, and bring its own experience on Nanomaterials
- **New contacts** - This is also very important, in order to increase the possible lineup of customers (i.e pinturas monto) and suppliers (i.e. Ardeje, Torrecid or Plasma Chem).
- **Safety protocols and protective equipment** – The development of new Risk Management Measures and Risk Management Strategies, together with the definition of their **cost effectiveness** is a fundamental result for Tec Star Laboratory to understand how to behave to work in a safe environment and in order to produce safe products for the end-users. Of course the cost impact is fundamental → **Exploitation Plan**
- **New products** - This is one of the major outcome for Tec Star. → **Exploitation Plan**
- **Larger credibility** - This is a real major outcome for Tec Star. Improving the **consumer acceptance** of these novel technologies is directly connected with the market share possibly reachable and this, on a general basis, is the most important outcome that Tec Star is looking for. → **Exploitation Plan**

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Results, cost, benefits

- **New products** - major outcome for Tec Star. → **Exploitation Plan**

In particular Tec Star, within the NanoMicex project, worked on 2 main products:

1. **TiO_2 Nanoparticles** - In accordance with the collaboration with the partner Montò, Tec Star developed a stable water-based nanofluid with TiO_2 Nanoparticles.
2. **ZnO Nanoparticles** - Protocol to minimize the cytotoxicity of ZnO Nanoparticles, developed by YU, has been tested and "upscaled" at TEC Star laboratory.

CASE STUDIES AT TEC STAR

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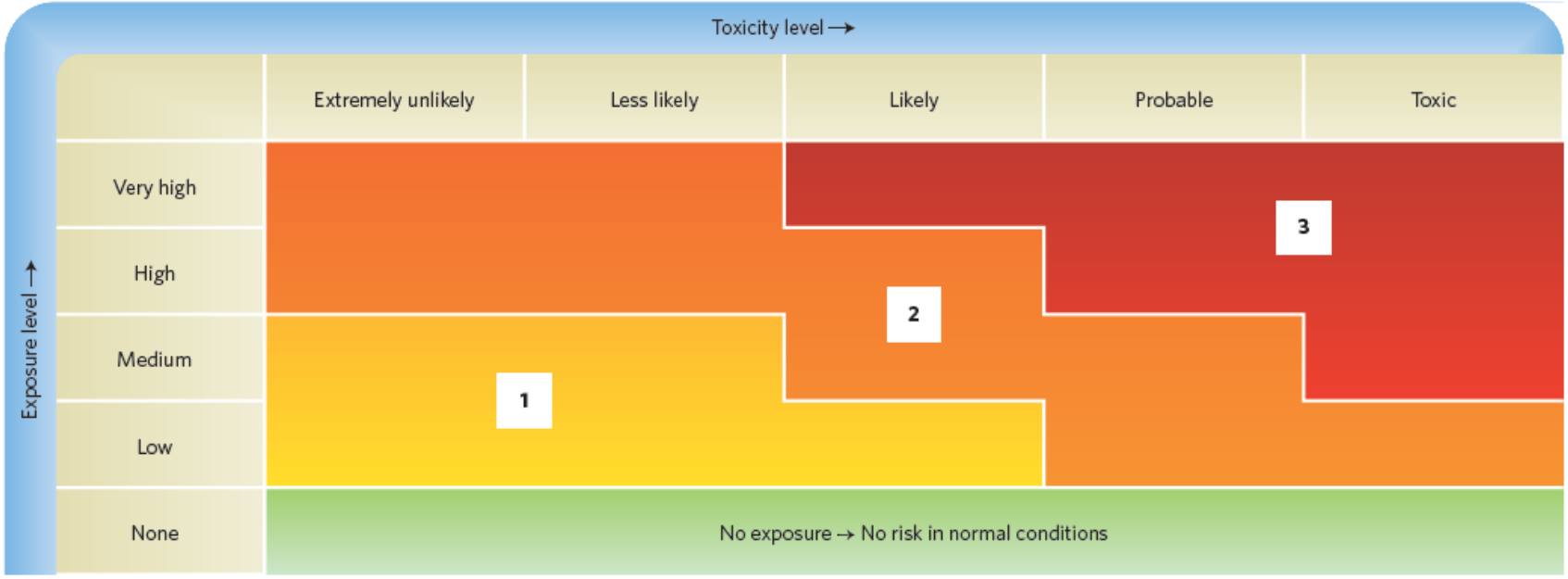
How to read the Guide

Mitigating risk (hazard and/or exposure) is essential to ensure the sustainability of nanotechnology



Risk level	Situation	Underwriting decision
1 (low)	Acceptable	Insurable
2 (moderate)	To be improved	Insurable subject to extra precautionary measures taken to manage worker's exposure to nanomaterials. This may include adherence to standard operating procedures to reduce exposure or chemical coating to reduce the toxicity (if applicable). Another alternative would be to adjust the contract wording to limit exposure to a claims made basis only (the occurence has to take place during the insured period thus eliminating long-tailed risk).
3 (high)	Unacceptable	Uninsurable

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How to read the Guide - Guide Design

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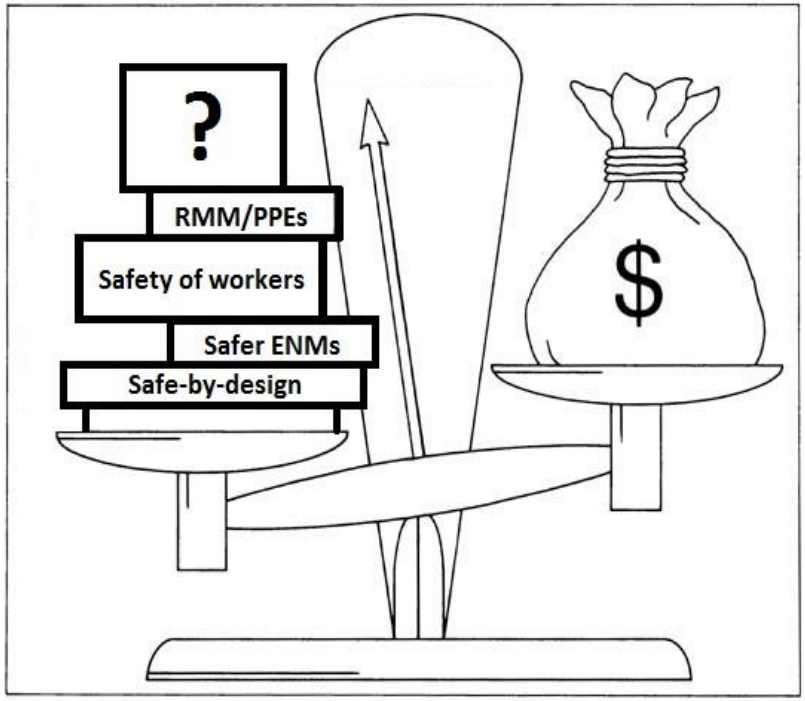
Exploitation plans - Conclusions

The CEA scale: Investments vs results:



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THANK YOU FOR YOUR ATTENTION!

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SEVENTH FRAMEWORK PROGRAMME