I-CanNano™

I-Can™ Nanotech Paints & Coatings
For
'Green Building' Construction Applications

- An Introduction

Innovation Center for Applied Nanotechnology - I-CanNano™
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Introduction

Innovation Center for Applied Nanotechnology (I-CanNano/ I-Can) is promoted by technocrats and 1st generation entrepreneurs in emerging technology domain.

I-CanNano is the outcome of decade long research on nanotechnology & nano-materials by Dr. Arup Chatterjee (CEO & Director), global authority on nano-materials. He has developed indigenous process technology for manufacturing of nano-materials and developed nano-enabled products for commercialization.

Robust proprietary nano-material synthesis process technology indigenously developed by Dr. Arup Chatterjee, I-CanNano addresses key synthesis issues faced by Scientists globally:

- High Purity : 99.9% on an average
- Tunable Particle Size at 99.9% purity.
- Easy Scale-up, manufacturing in kg quantity and of high purity
- Cost effective manufacturing process

I-CanNano also has developed

- Dispersion technology to mix nano-materials in various media
- Paints & Coatings Formulations for development of nano-paints & coatings

So, I-Can has integrated capability to manufacture tailor made nano-materials to nano-enabled paints & coatings.

Nanotechnology based Paints/ Coatings

Nano meter is one billionth of a meter i.e. 1 nm = 10^{-9} m

Human Hair = 4500 nm

Nanotech is all about particle size below 100 nm.

Nanotechnology takes it's root from various elements of periodic table (say Carbon, Silver, Iron, Platinum, Aluminium etc.) in near atomic size form (i.e. below 100 nm size

particles) and also various oxides, nitrides, compounds in nano-form. These materials are produced at very high temperatures ~ 1000 Deg C and structurally defect-free.

At near atomic size, particles exhibit newer properties and these are dominated by quantum phenomena. By exploiting those new properties, new materials can be made aiming at various applications and towards solving many problems.

Nano-size: Change in properties

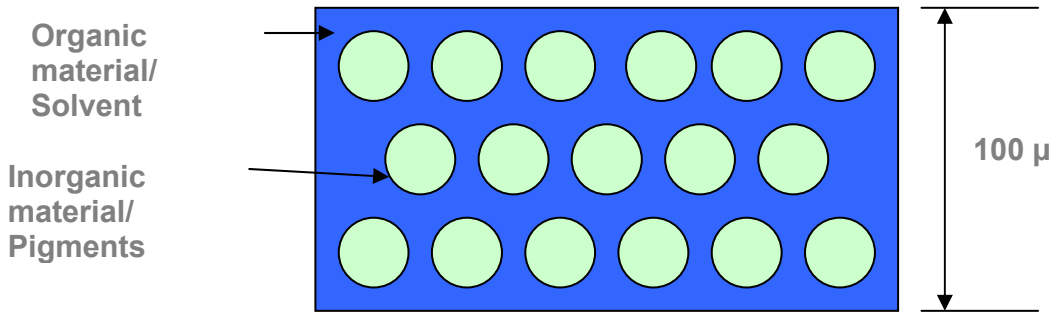
- Particle properties dominated by Quantum Behavior,
- Physical Properties: Color, transparency, hardness, magnetism, or electrical conductivity can change completely
- Optical, magnetic, electrical, thermo dynamical, microbial and binding properties changes compared to bulk conditions of the same material.
- Toxicity change.
- Melting and boiling point altered,
- Chemical reactivity and catalytic processes improved.
- Particles with primary particle sizes below 100 nanometers are characterized by an extremely large surface-to-volume ratio: whereas with particle sizes of 1 micrometer, i.e. 1000 nm, only about 1.5 thousandths of a percent of all atoms are located on the surface, with a diameter of 10 nm it is already about 15 percent. The properties are thus determined mainly by the behavior of the surface.
- It is possible to deliberately modify the properties of surfaces and endow them with any desired function.

Paint Coating is one such area, highly impacted by nanotechnology and various novel properties like water repellency, thermal elasticity, anti-fungal/ algae/ bacteria, quick drying, no/low VOC (solvent) etc. are incorporated in the paint matrix.

At nano-size, particles are having defect-free structures and robust in performance. For example, carbon nano-tubes are 100 times stronger than still yet $1/6^{th}$ weight of steel.

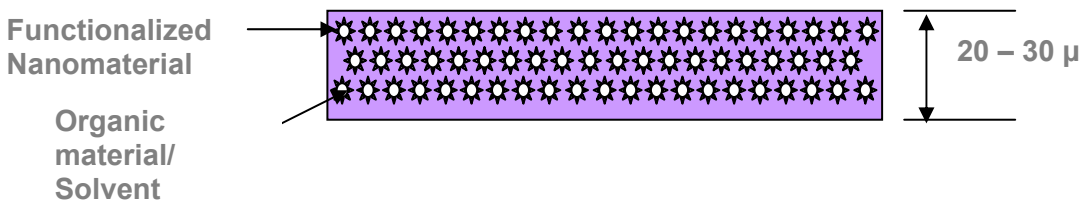
Nano-paint System vs.	Conventional Paint System
Water base paints with inorganic nano-materials.	Solvent & organic based paints
Inorganic nano-materials are dispersed in paint matrix. These **inorganic nano-materials** are very robust in performance and so paint matrix exhibit high performance	**Organic material** based, so susceptible to ageing and low performance
Nano sized materials, so hardly any gaps between particles, leading to good performance of paint matrix while coated on a surface.	Micron sized materials, so gaps between the organic materials are high. So, more porosity leading to low performance.
Thickness of paint is low: 30 - 50 microns	Thickness of paint is generally high. More materials are required to paint surface.
Robust water/ dust repellent performance paint	No such characteristics in paint matrix.
High UV Resistance, so resistant to fading of color. (Nano-materials with high band gaps are manufactured that absorbs UV lights)	Low UV Resistance and so fading of paint is quicker.
Anti-sticking paint	No such characteristics in paint matrix.
Robust anti-bacterial/ algae/ fungal properties based on inorganic nano-materials.	Low performing organic materials in paint matrix, so poor performance.
Low Volatile Organic Compound. So, no environment and health & safety issues.	High VOC and less environment friendly and having health & safety issues.
Heat insulating properties in the paint & thermally elastic nano-materials resist cracks.	Heat insulation & crack resistance is not present.
Quick drying paints	Higher drying time.
Higher Coverage Area	Lower coverage area.
Gets embedded in plaster surface, not like film, even penetrates inside porous surface to some extent. So, life of paint would likely to be higher.	Forms film on the surface, so life tends to be less.

Conventional Paint System



I-CanNano™

Nanotechnology Paint System



In nanotechnology paint system, gaps between nano-size particles are minimal due to self-assembly features incorporated and small size particles. However, in conventional paint system micron size materials are used, leading to gaps between particles. Robust performance of nanotechnology paint system is due to inorganic nano-materials that are structurally defect-free, whereas organic materials used in conventional paint system is susceptible to ageing & low performance. In nanotech paints, novel features are incorporated in nano-materials & dispersed in paint matrix. Thus nanotechnology paint system is having superior performance as well as novel characteristics that are not available in conventional paint system.

I-Can nano-Paints & Coatings

1. Water base paints

- Primer
- Interior glossy finish
- Interior matt finish
- Exterior glossy finish
- Exterior matt finish
- Elastomeric primer & finish
- Anti-sticking finish

Features

- Water repellent
- Anti-fungal/ algae/ bacteria
- High UV & Scratch Resistant
- Quick Drying

- High coverage area
- High gloss
- No/Low VOC….environment friendly
- Gets embedded in plaster walls

Color

- 136 color shades available now and also metallic colors
- Can produce any color shade requested
- Alternatively, can produce base material in white and tinting available in the market can be used for attaining requisite color shade.

Application instructions

- Add 30% water in the base material (primer and finish) and mix it to get uniform matrix. Do not add anything else.
- Apply primer single coat on dry unpainted/ properly scrubbed wall/ plaster surface with brush or roller
- Allow around 4 hours to dry
- Apply finish, two coats to ensure that no portion is left out
- Allow 4 hours to dry at ambient temperature conditions

2. Nano Coatings

- Anti-damp coating (n-constrkoat)
- Glass coating
- Ceramic Coating
- Stone Coating
- Leather Coating

Features

- Water repellent
- Breathable i.e. air can pass water cannot pass
- UV Resistant
- Anti-fungal/ algae/ bacteria
- Not polymer based, so due to ageing or abrasion no chance of polymer layer breaking

- Gets embedded on the surface, not a film like, hence long life
- Transparent (no color)
- Thickness of coating ~ 0.05 micron (i.e. 50 nm)
- Seals off micro-pores and so improves smoothness of surface

Application Instructions

- Apply the coating solution on clean & dry plaster surface with application of brush
- Ensure surface saturates during application
- Allow 3 hours (glass & ceramic) / 6 hours (plaster,stone,leather) for curing at ambient temperature conditions

3. Solvent Base Paints

- High Anti-corrosive Paint
- Heat Conducting Paint
- Electrically insulating paint
- Primers
- Clear Coat paint (Transparent)

Features

- High anti-corrosive (4000+ hrs salt spray)
- Scratch (6 kg) & Impact Resistant (20J+)
- UV Resistant (300+ hrs)
- Anti-bacteria
- Epoxy, PU, Alkyd based
- For metal & wood surface
- Air drying system, stoving system
- DFT ~ 50 microns (can provide matching DFT)

Application Instructions

- Apply one coat primer & two coat paint with brush/spray
- Thin & mix as per instructions in data sheet
- Allow for curing as per data sheet

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