Nano Technology Industrial Park at Cheorwon

Cheorwon Plasma Nano Technology Cluster

Cheorwon* Plasma Research Institute

Innovative Product utilizing a Novel Materials

Plasma Nano Technology Center provides not only Facility/Equipment but also The Technology

More than 10 companies currently licensed CPRI's nano technology for commercialization

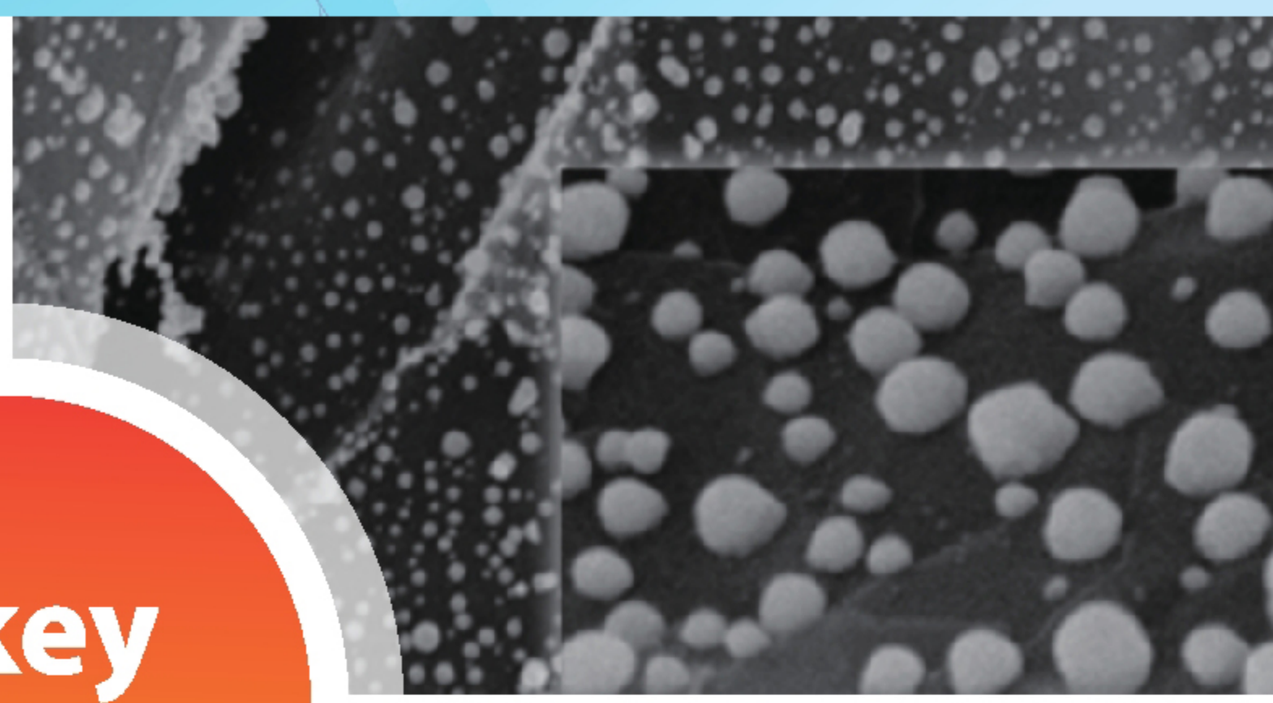
강원도 GANGWON PROVINCE

철원군 Cheorwon

CPRI Cheorwon Plasma Research Institute

1 | RF/DC Thermal Plasma
(7) patents

2 | Nano Metal / Carbon Hybrid
(3) materials patents



4 key Technologies

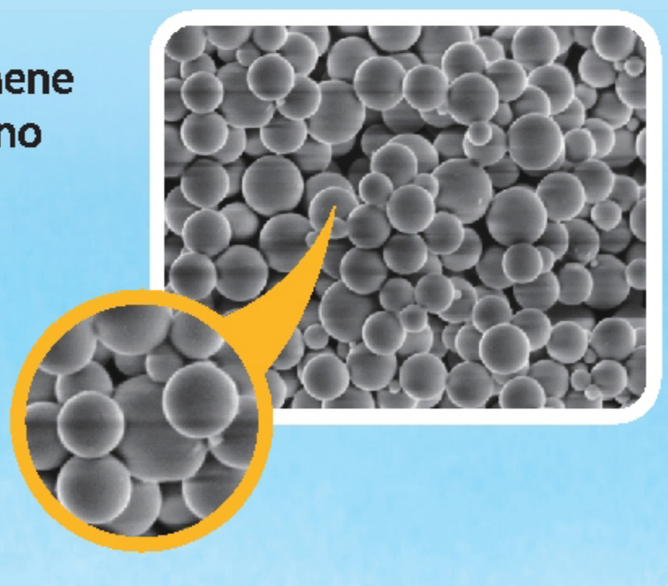
3 | OLED Lightings
(3) design patents

4 | Nano material Functionalization
(4) patents

Cheorwon Plasma Research Institute

Research expertise of CPRI is a nano-materials engineering by using plasma process.
CPRI developed a mass production systems for synthesis of nano-materials.
CPRI also reported a world first commercial level production of nano metal-graphene hybrid materials (nano sized metal such as Si, Ag, Ni, Sn, Cu, Al etc. bonded to nano graphene flakes)

CPRI introduces a world first nano-powder plasma system for surface modification, functionalization, CVD of nano-materials.

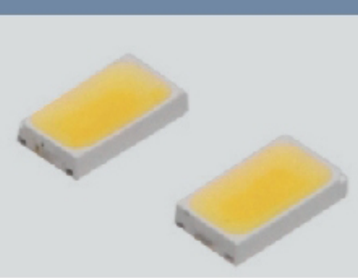


Cheorwon Plasma Nano Technology Cluster

INFOVION

dispersion equipment

ALLIX



LED Packaging

JSI

Activated Carbon

GNTNS

Coal Water Slurry &
Oil Burner System

Nanocasttech

Nano Material
production

NanoGate

Nano Magnetic Materials /
Magnetic Sensors

Nano Materials Production/Equipment Group

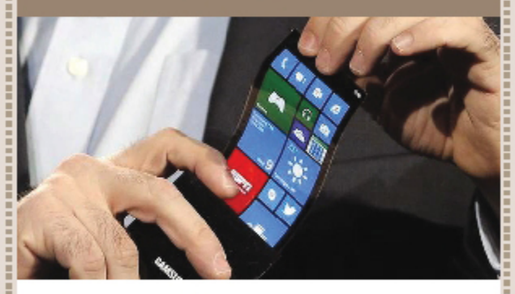
CPRI
Cheorwon Plasma Research Institute

Nano Materials Application Group

LMS

Flexible Heat
Spreader

Kolon



OLED Penal

Changsung

EMI/Nano-Ink

CoreTech

Automobile
Injection

OCI

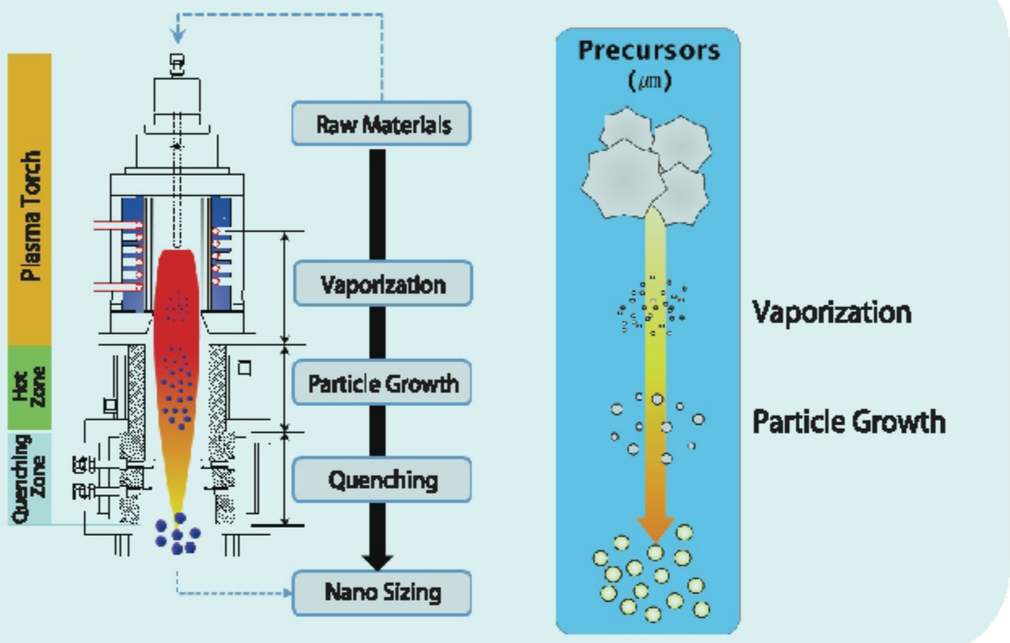
LIB
(Anode)

GLVISION

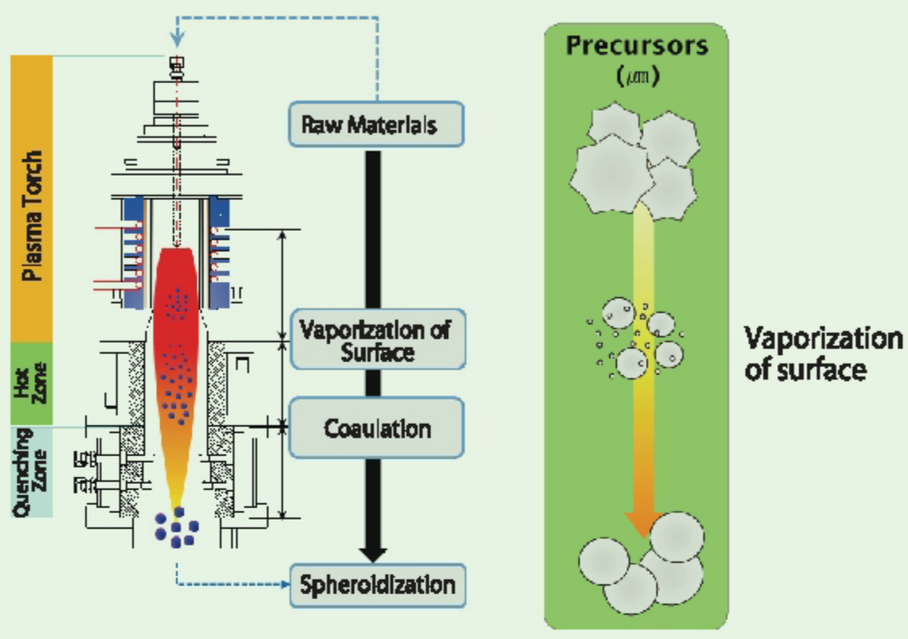
High CRI LED
Downlight

01 RF Thermal Plasma Nano Technology

Nano-materials synthesis

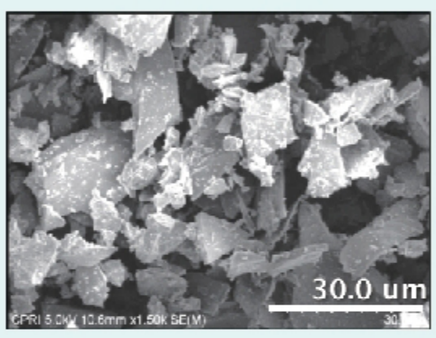


Spheroidization Process

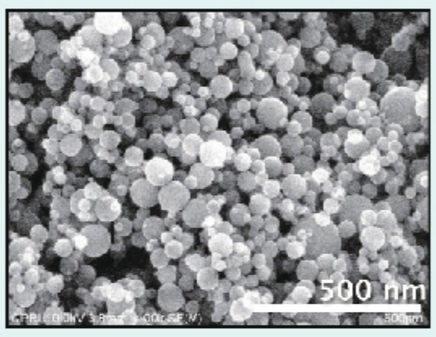


Nano Material (Si)

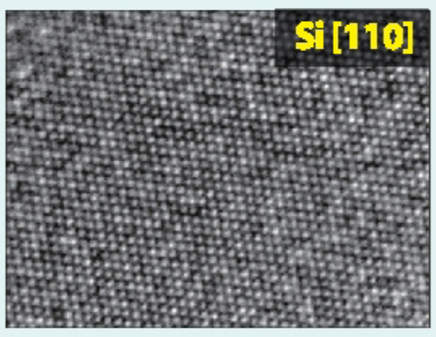
<raw material>



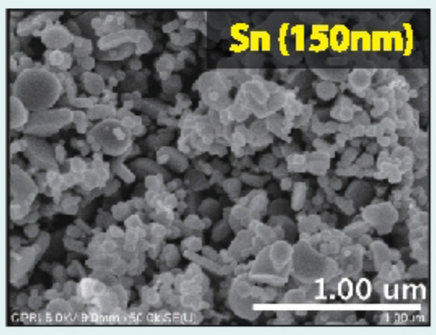
< nano material>

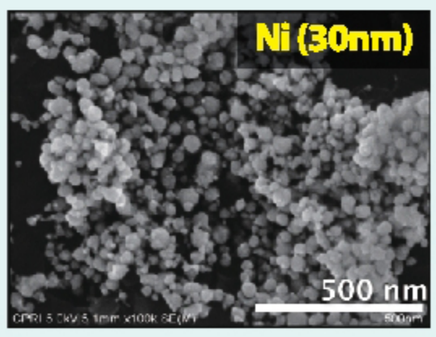


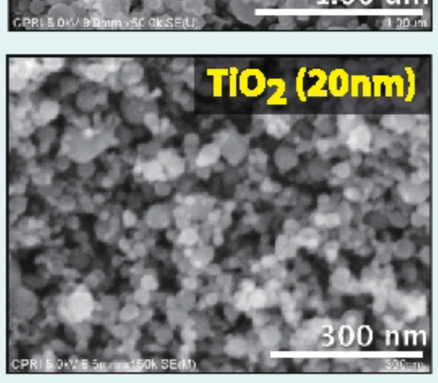
Avg. Particle Size	Color	Structure
50 – 70 nm	Brown yellow	Single crystalline

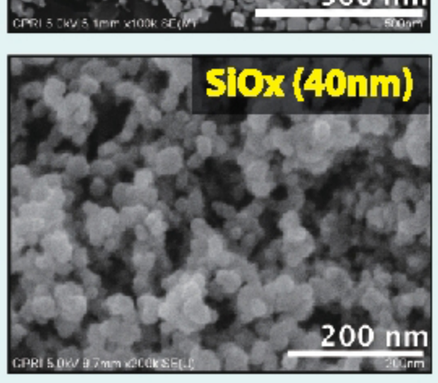


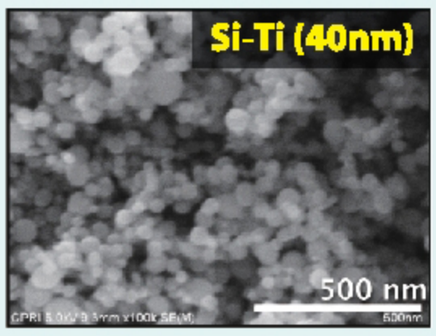
Others (Nano Powders)

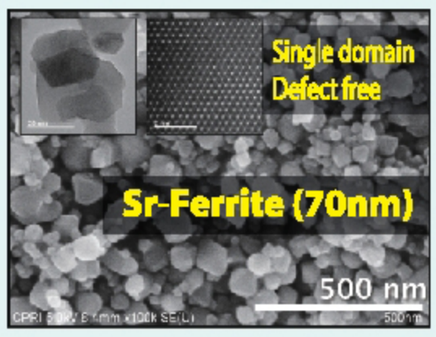












Spheroidization (Ba Glass)

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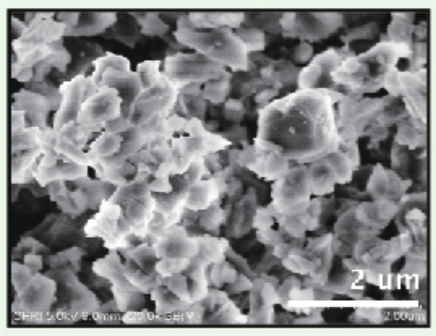
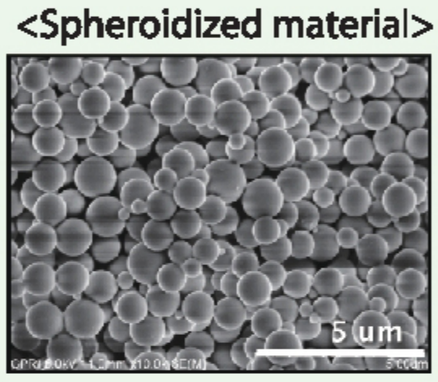


<Spheroidized material>



Spheroidization (SrO-Al_2O_3)

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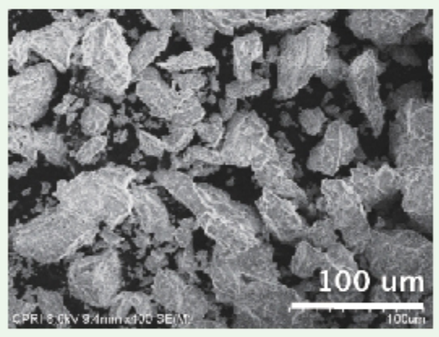

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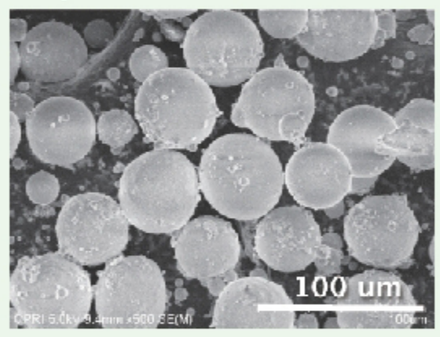

Spheroidization (Silicon)

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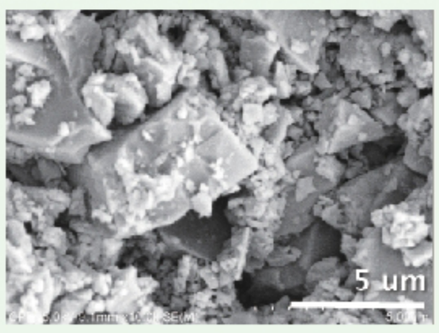

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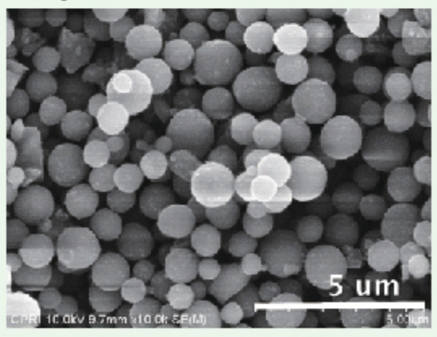

Spheroidization (Alumina, Al_2O_3)

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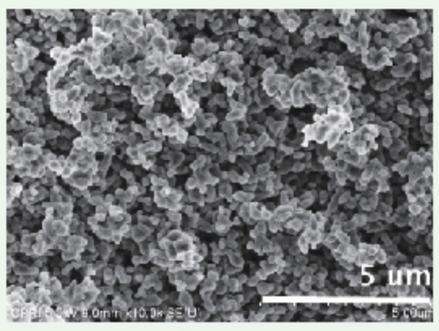

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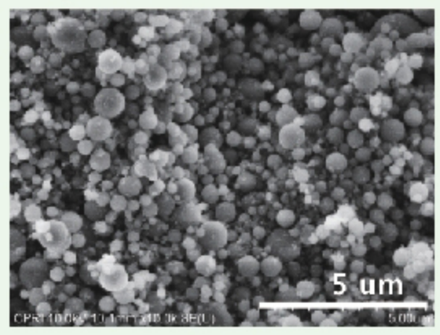
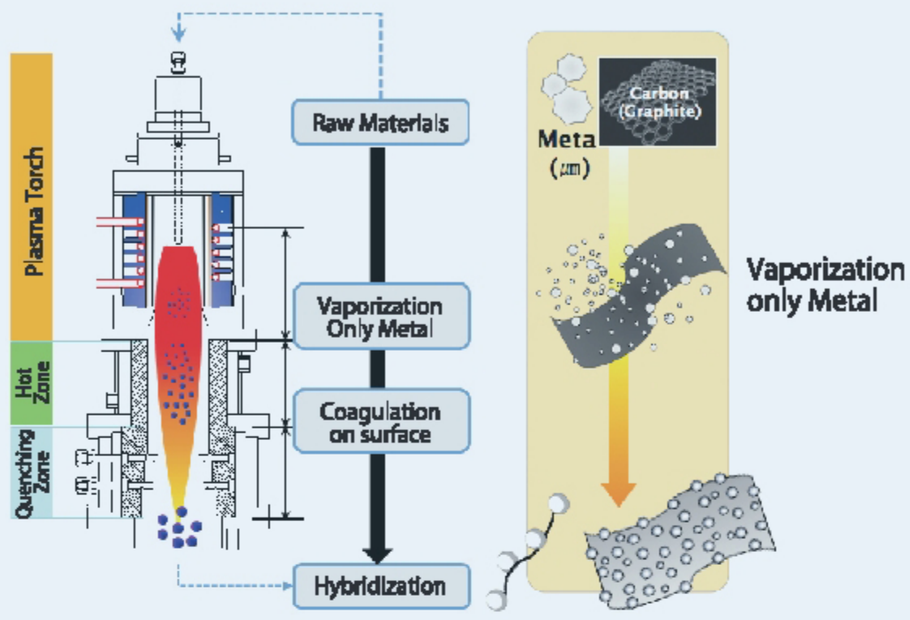
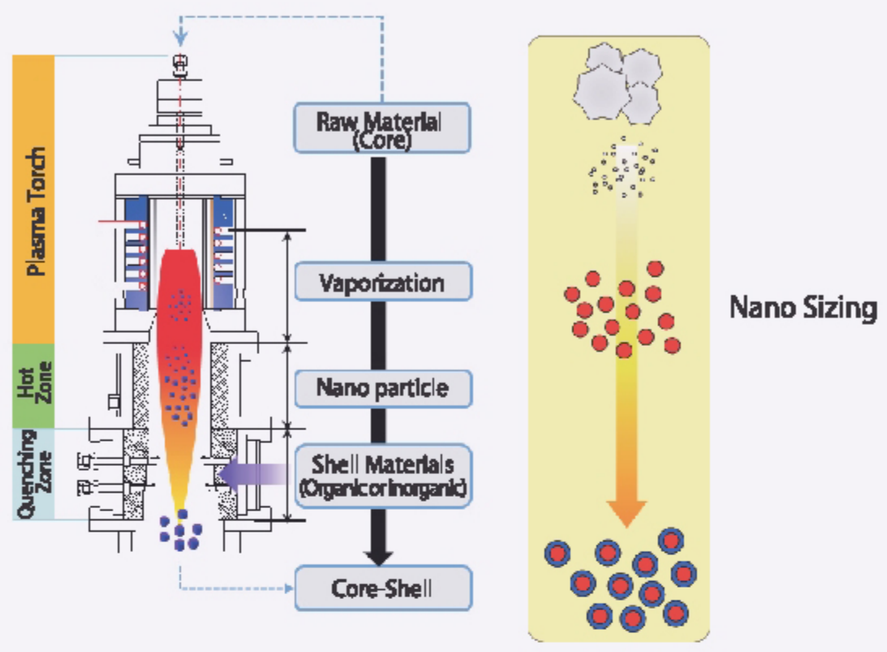


>>>> RF Thermal Plasma Nano Technology

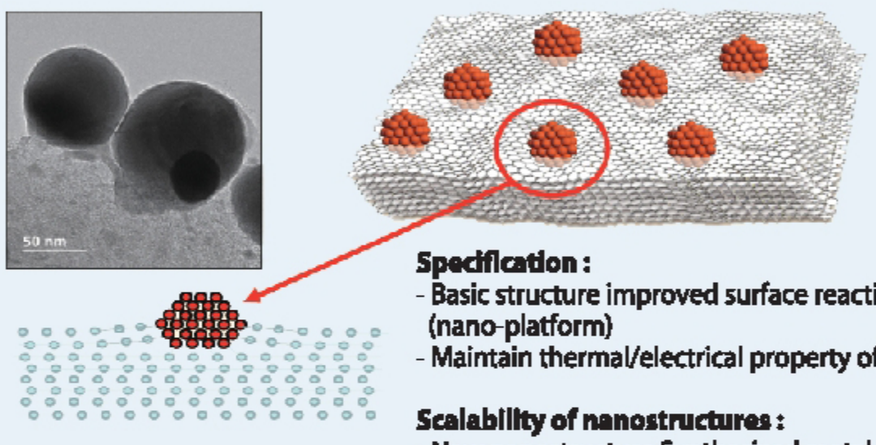
Nano-metal /Carbon Hybrid



In-situ Core-Shell Process



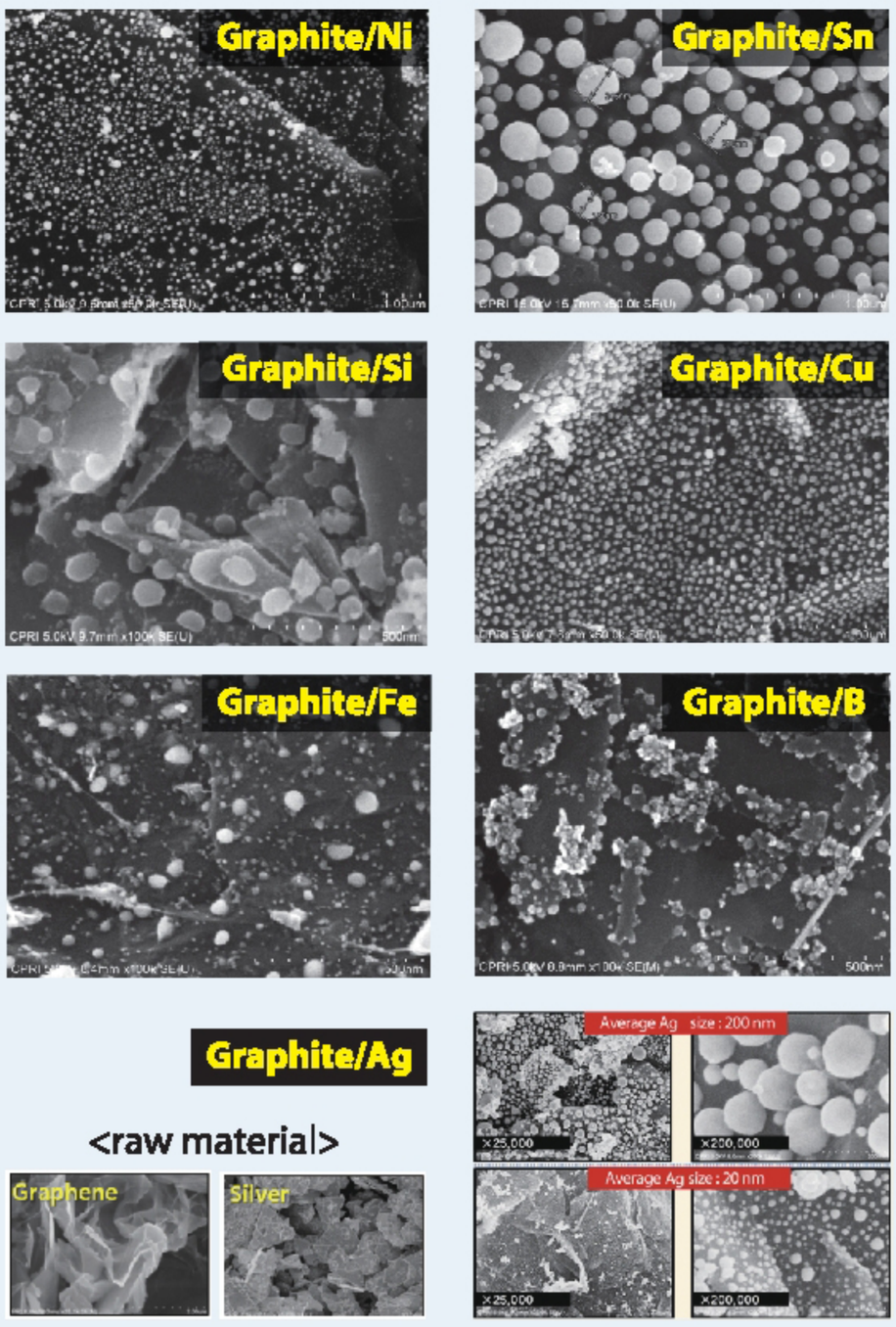
Nano Metal/Graphite Nano Platform



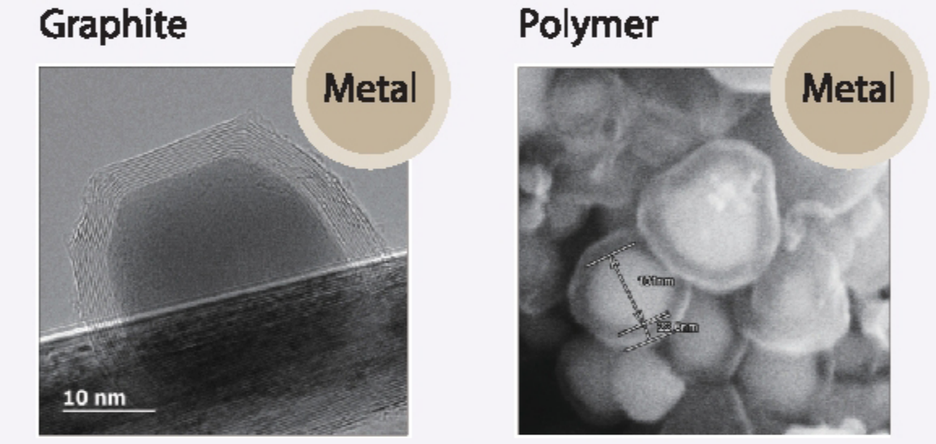
Specification :
- Basic structure improved surface reactivity (nano-platform)
- Maintain thermal/electrical property of graphite

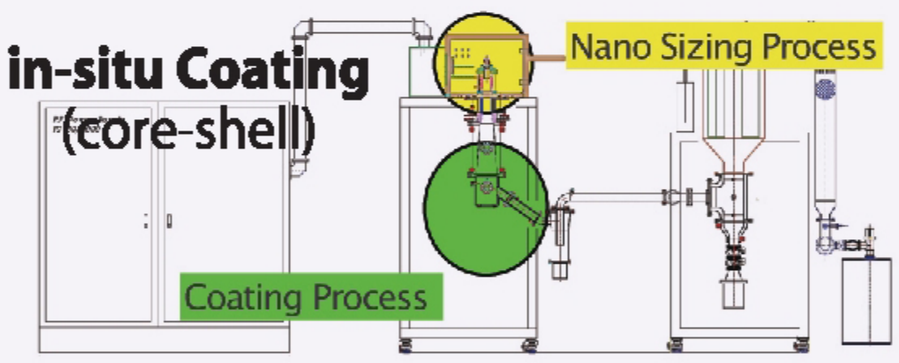
Scalability of nanostructures :
- New nanostructure Synthesized metal, ceramic, polymer, biomaterial on surface of nano metal

Nano-metal/Carbon Hybrid Compounds

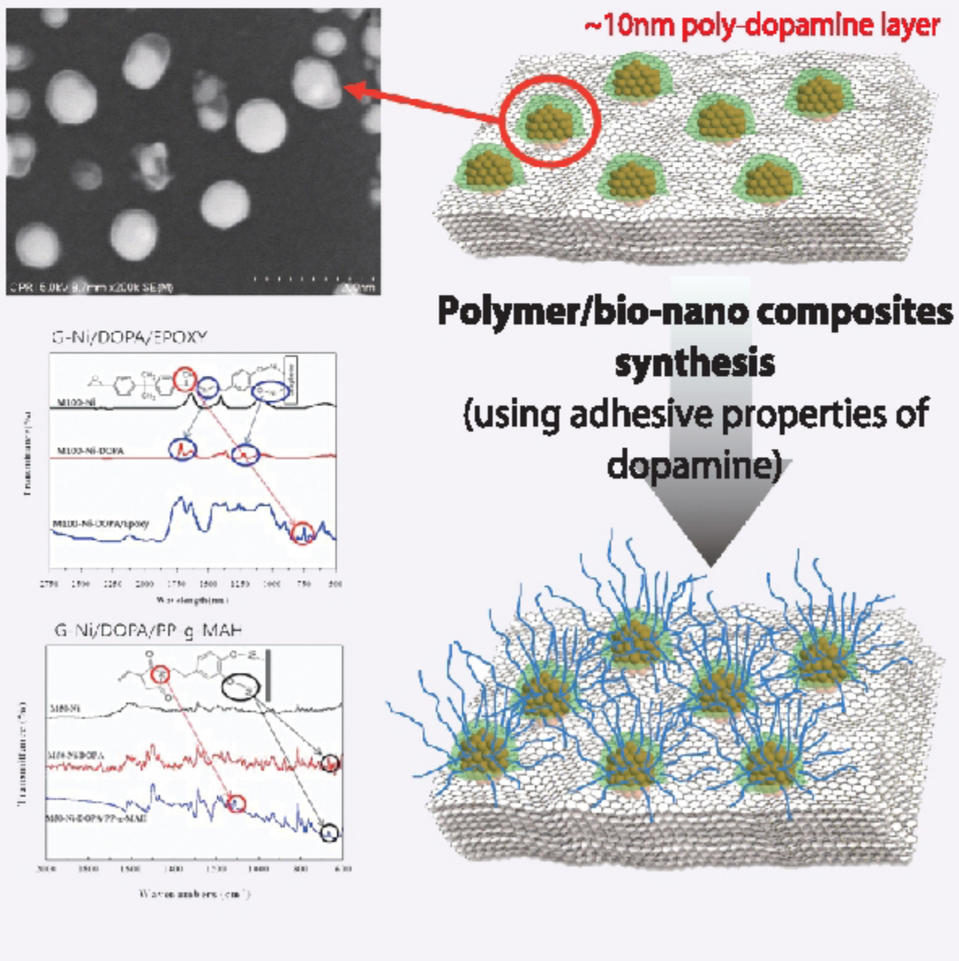


In-situ Coating Process on nano-Metal





Nano-Metal / Graphite & Polymer Composite by poly-dopamine nano coating



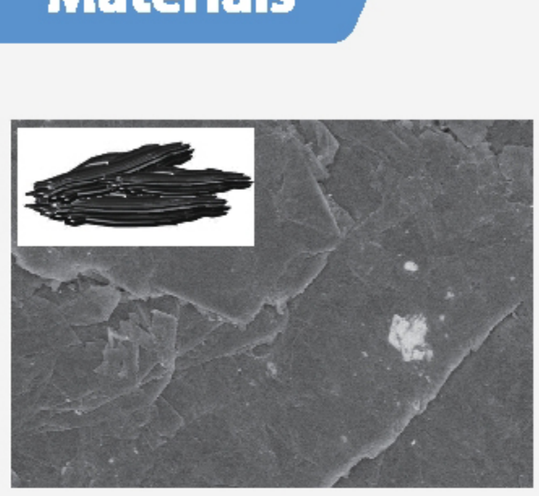
Polymer/bio-nano composites synthesis
(using adhesive properties of dopamine)

02

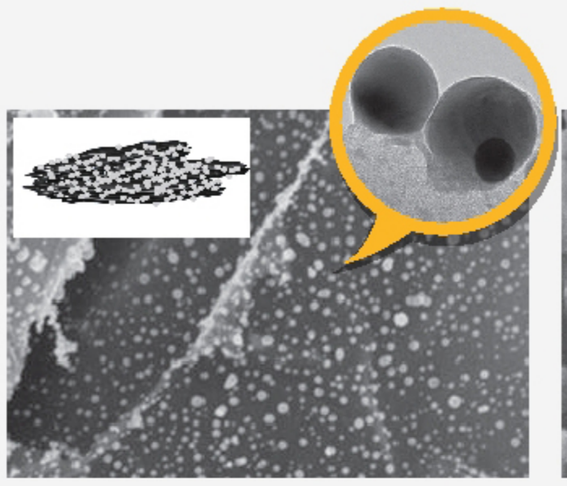
Nanocomposites in CPRI

Amogreentech

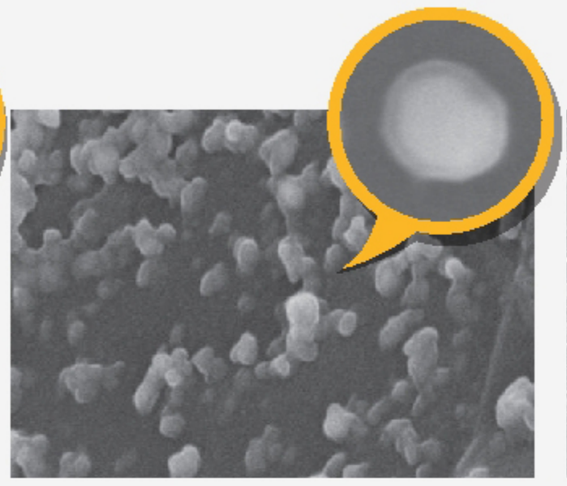
Materials



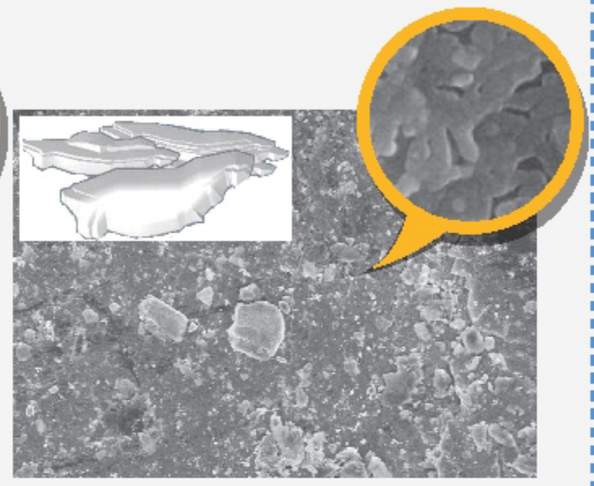
Graphite



Nano metal-Graphite



Functionalized metal-Graphite

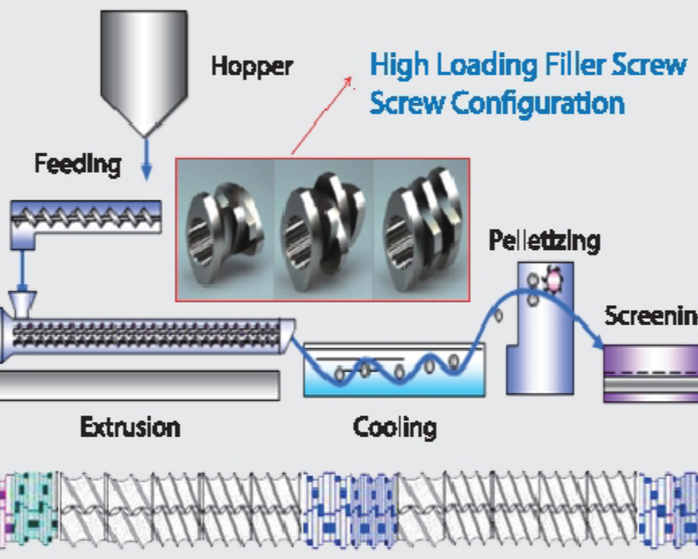


Insulated-Graphite

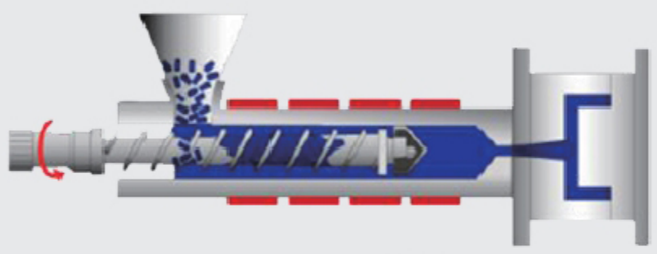
Processing

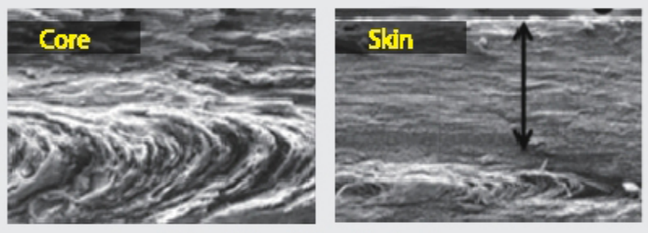
Conductive Filter

Polymer



Thermal Conductive/EMI Compounds

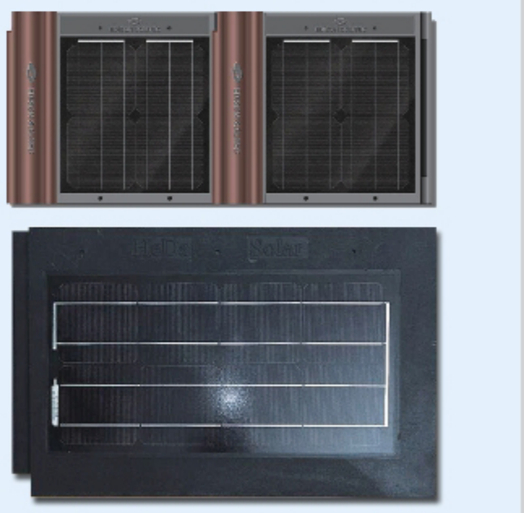




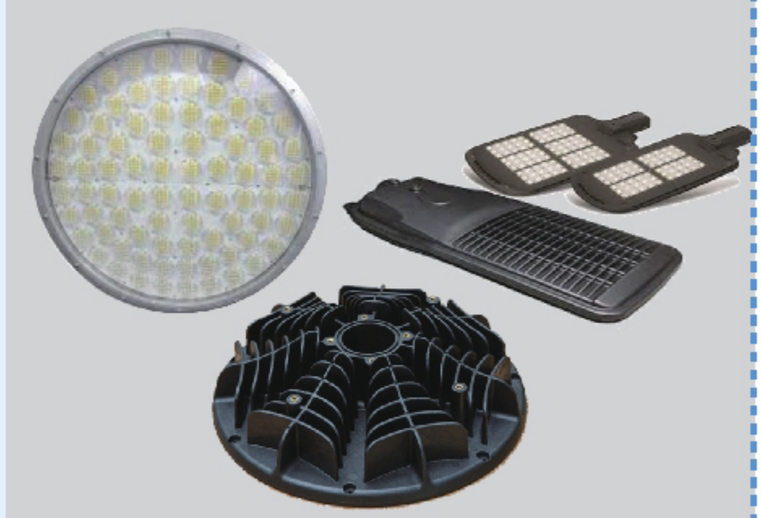
Filter Orientation Technology

Applications

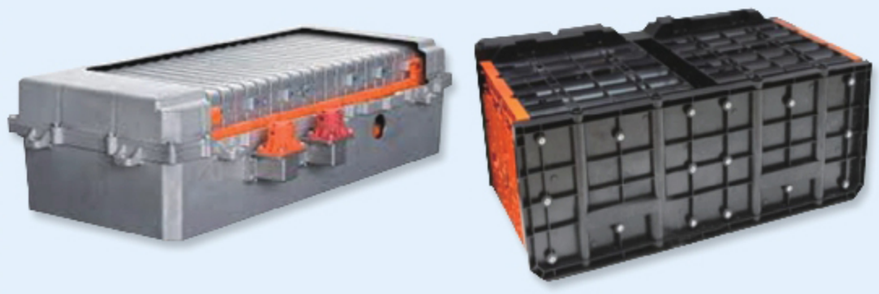
Thermal Compounds



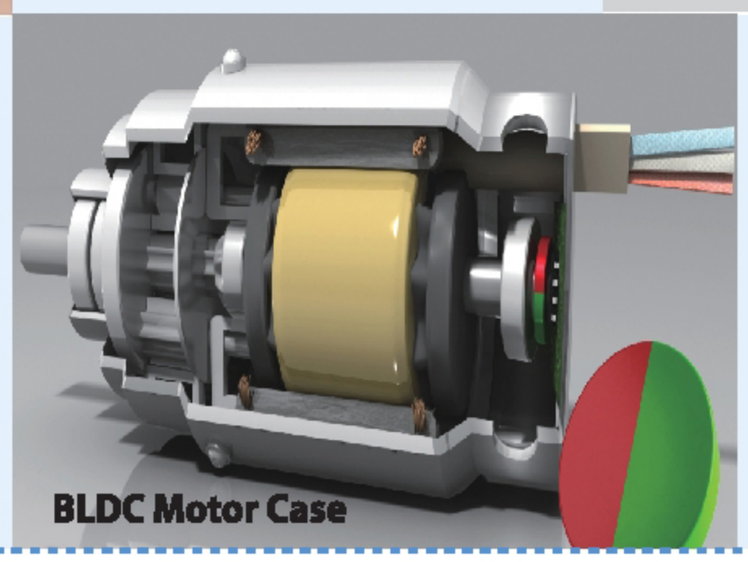
Solar cell



LED Heat sink



EV-Battery Case



BLDC Motor Case

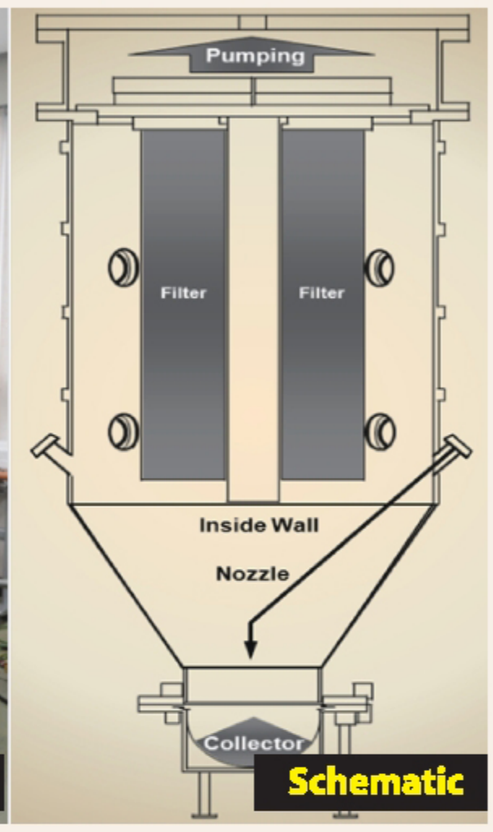
Sensor Motor

03 Powder Functional Plasma System

Filter Adsorption Type

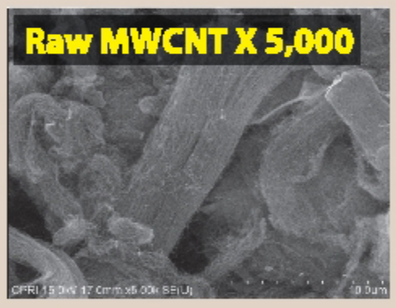
Plasma Powder Treatment System

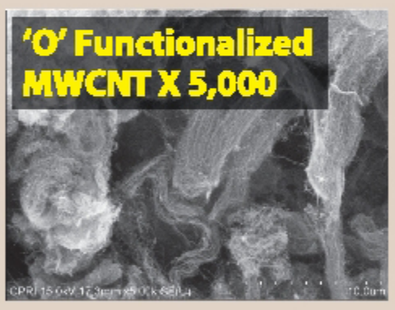

Real Image



Schematic

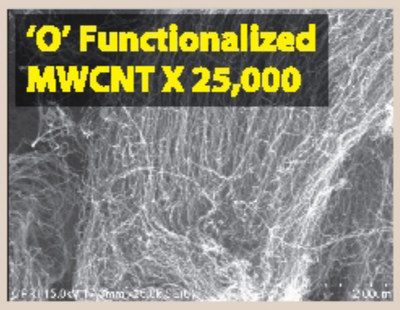
- Size : 1000(W) x 2000(D) x 2300(H)
- Radio Frequency Power (Max. 250W)
- Volume of Chamber : ~245.5L
- Mass Flow Controller System
- Rotary Pump Vacuum Condition
- 4 Adsorption Metal Filters
- Functionalized Powder Yield Rate : 80~90%
- High Performance Uniformity (>90%)

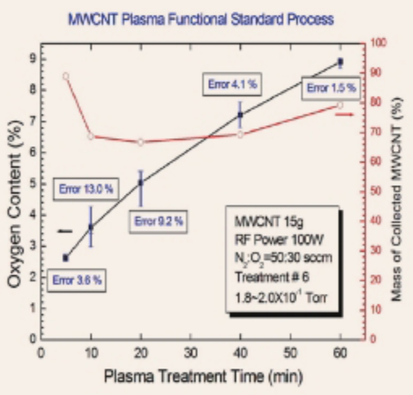

Raw MWCNT X 5,000


'O' Functionalized MWCNT X 5,000

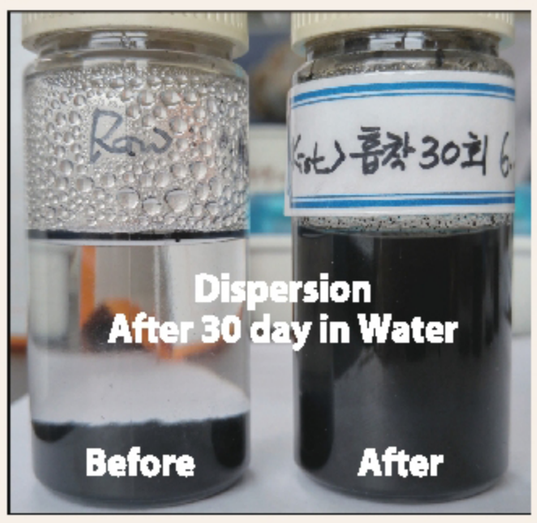
Functionalized powder image change


Raw MWCNT X 25,000


'O' Functionalized MWCNT X 25,000



Oxygen-functionalized MWCNT



special feature

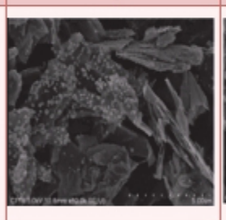
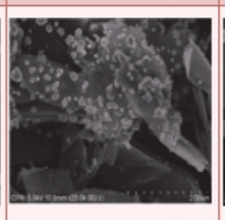
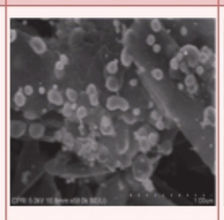
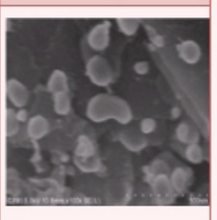
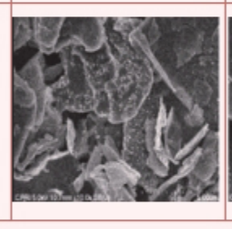
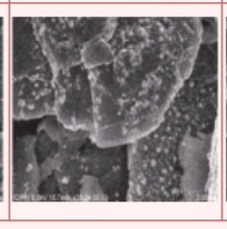
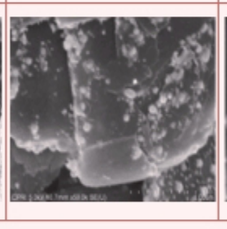
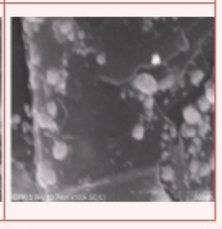
- Almost Powder can be processed
- Highly Functional Process
- Almost 70~90% Powder Collected
- Cycling Repeat Process

Circulating Type

Atmospheric Pressure Plasma

specification

- Gliding Arc
- Powder Circulation
- Repetition Treatment
- Reservoir Volume : 25 L
- Power : 1.5 kw
- Blower Speed Control

	X 10,000	X 25,000	X 50,000	X 100,000
Untreated				
Plasma treated				

Uniformly distributed Ni particles on graphite surface After the plasma treatment


Plasma Discharge

Mapping C-Red, O-Blue, Ni-Green

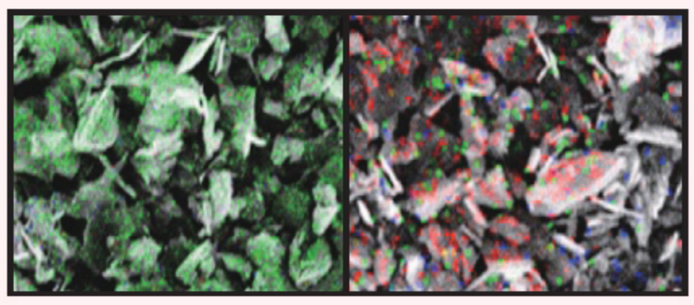


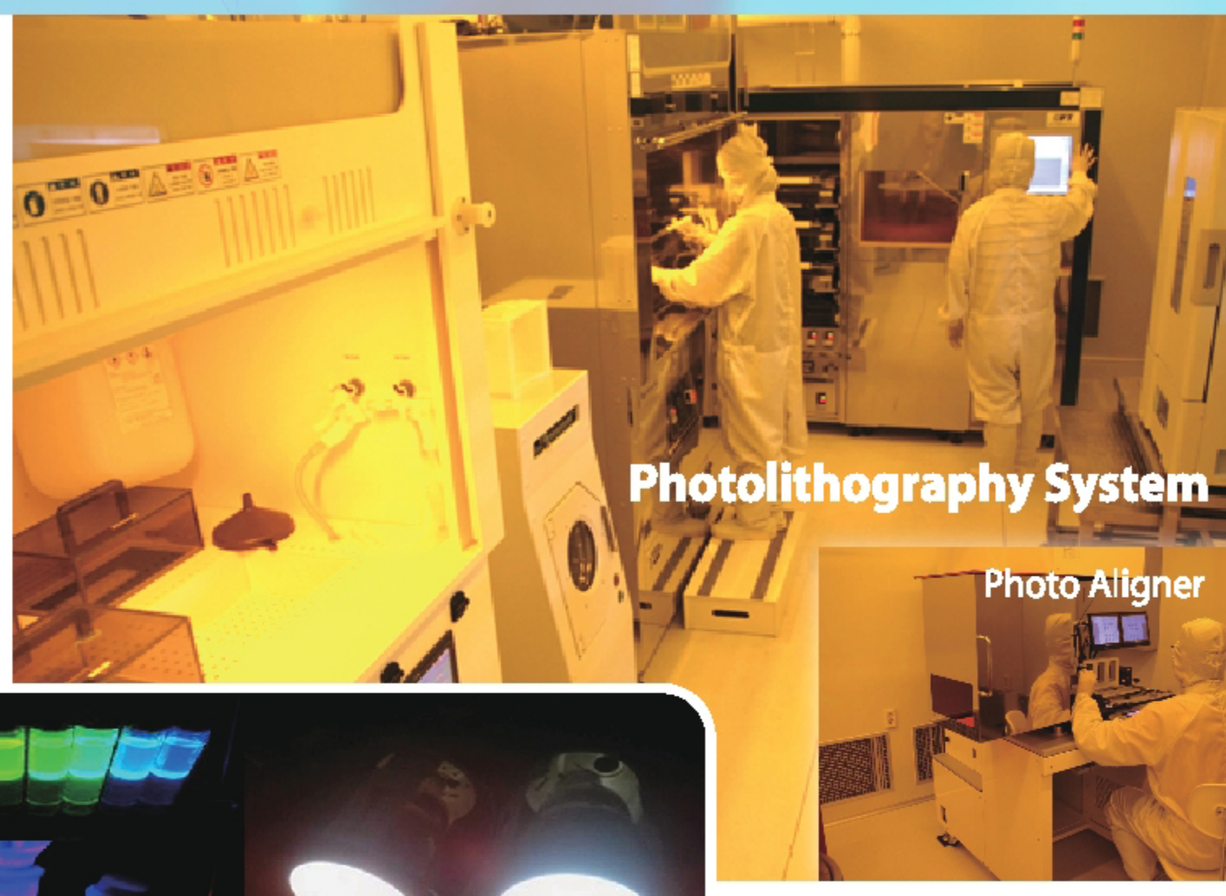
Image Mapping of O, C, Ni, after the plasma treatment, Functional O distributed generally edge of graphene.

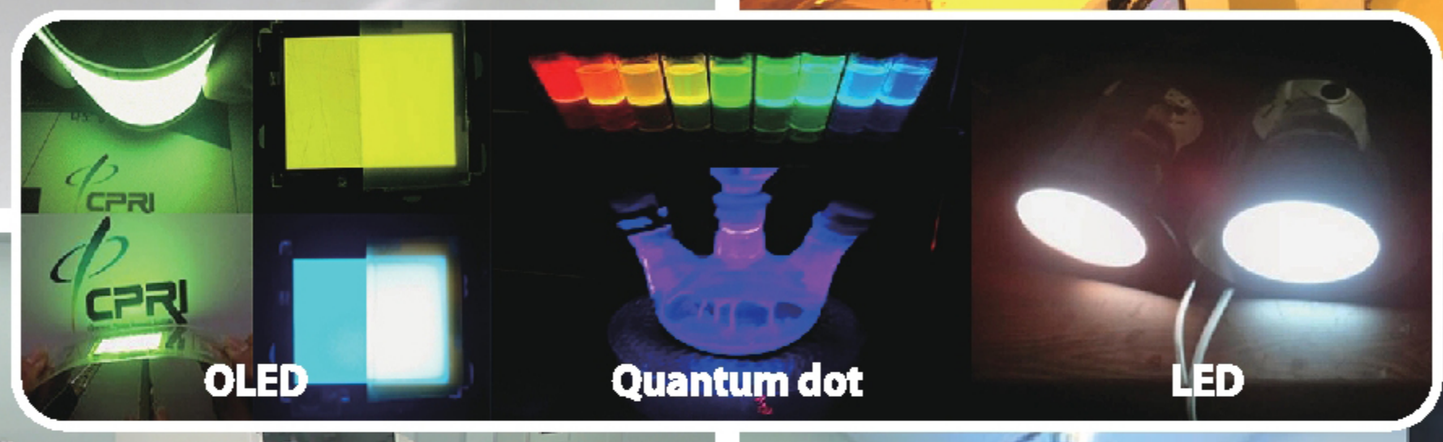
special feature

- Production 0.5 kg/hr for MWCNT
- Production 1 kg/hr for Graphene
- Production 10 kg/hr for Ceramic

04 LED/OLED ICT Convergence Research Center

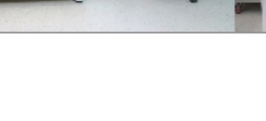
Facility for OLED & LED Lighting



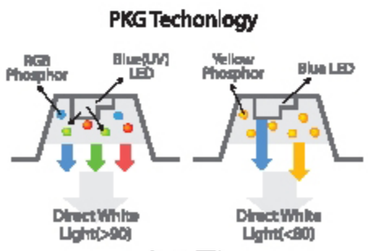
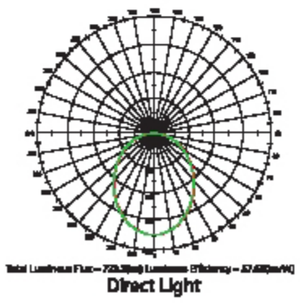
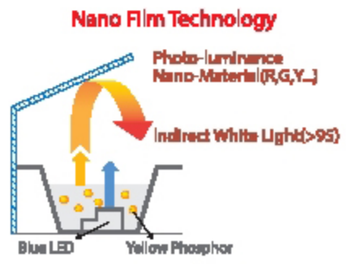
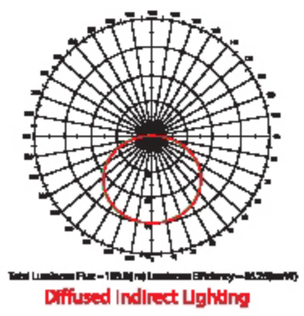


OLED/LED Lighting Technology

OLED Lighting Technology

	OLED Structure	Lighting Extraction Film Structure	Performance			
			Name	Efficiency (lm/w)	CRI	CCT
Normal WOLED		Only Improvement of Light extraction	WOLED Bare	100%	78	2,268
			WOLED + Normal Film	150%	75	2,495
CPRI WOLED		 Improvement of not only Light extraction but also CRI Simultaneously	WOLED + CPRI Film	150%	87	2,130

LED Lighting Technology

	Structure	CRI	Light distribution
Direct ED Lighting (Normal)		 Low CRI (Low Thermal Stability)	 Direct Light
Diffused Indirect LED Lighting (GLV)		 High CRI (High Thermal Stability)	 Diffused Indirect Lighting