



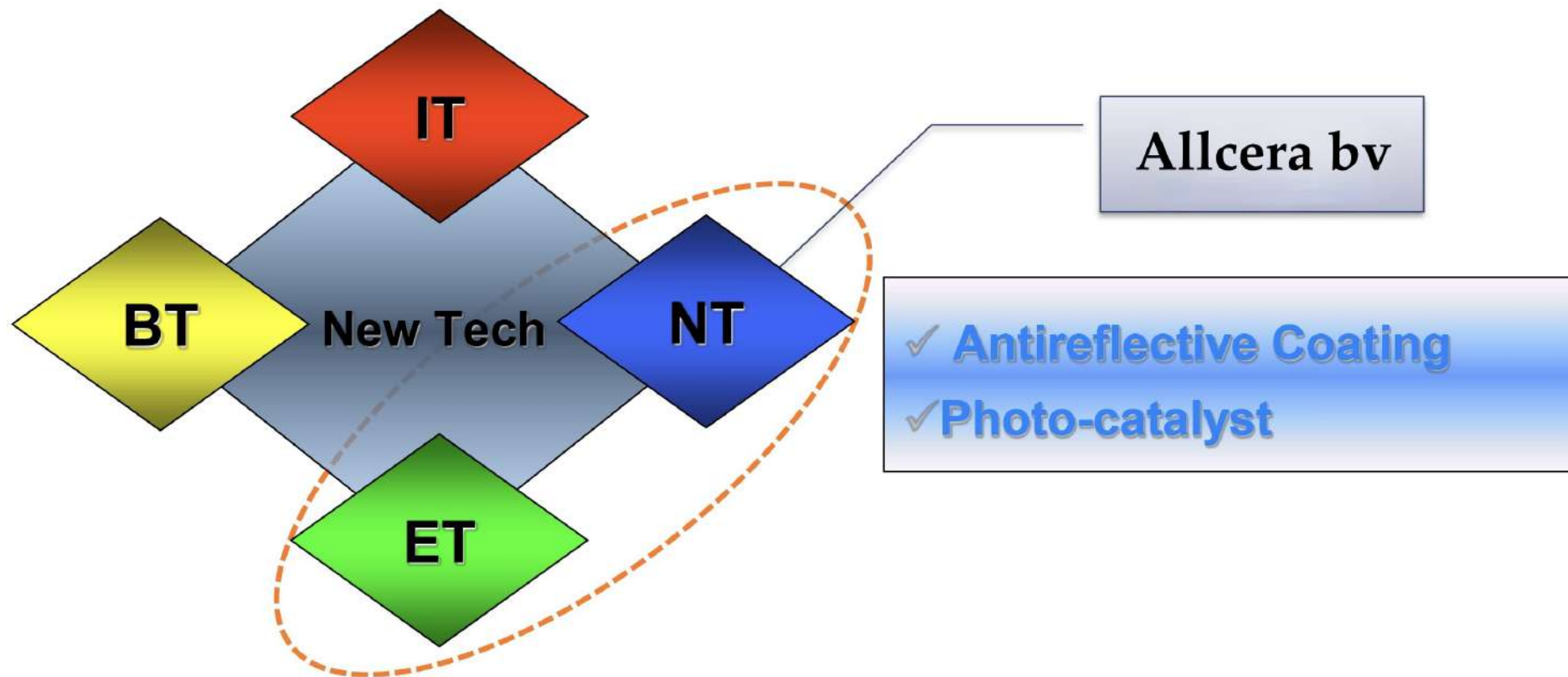
Self-cleaning coating for solar panels



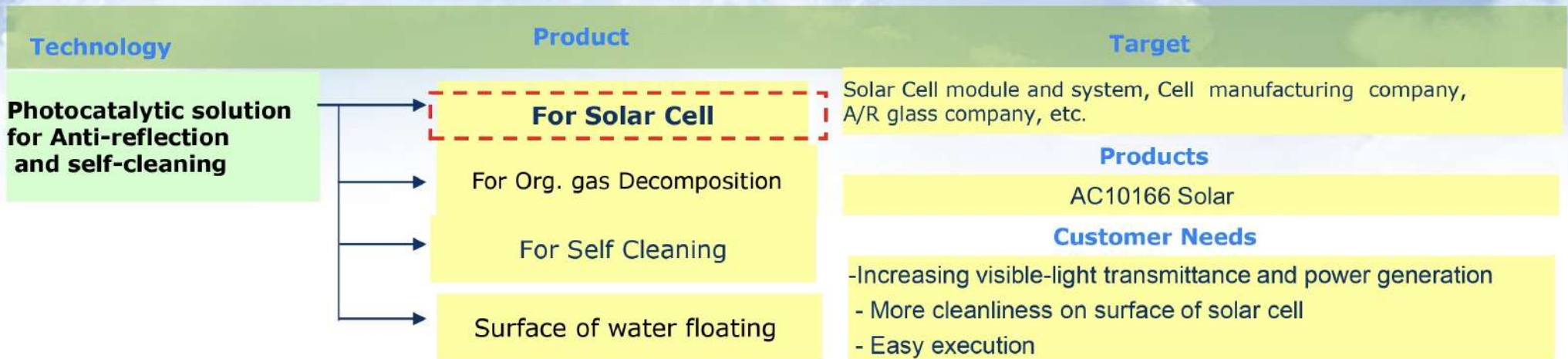
AC10166

Business Scope

Next generation growth engine



Product – Photo-catalyst



R&D Part

technology of titanium oxide coating solution with tungsten oxide for anti-reflection on glass of solar cell
 Photocatalytic solution for non-reflectiveness and the glass substrate coated with the solution

Patented

Certification of Solar Cell module..

Increasing visible-light transmittance more than by 3% and power generation by 2.8%
 Completion of Pilot Coating Line equipment . -
 Semi-permanent durability by QUV test result

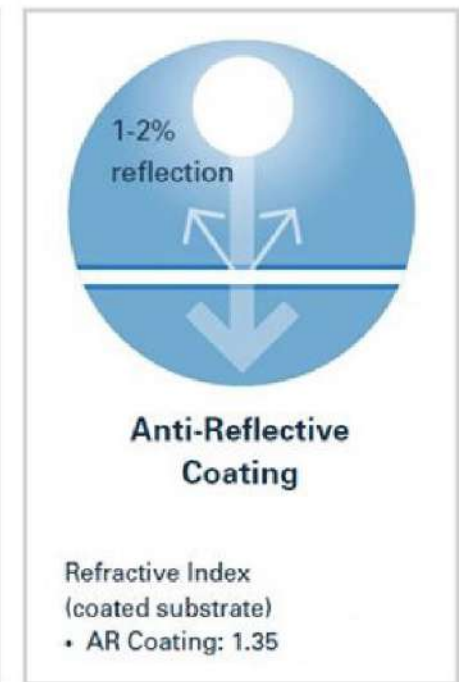
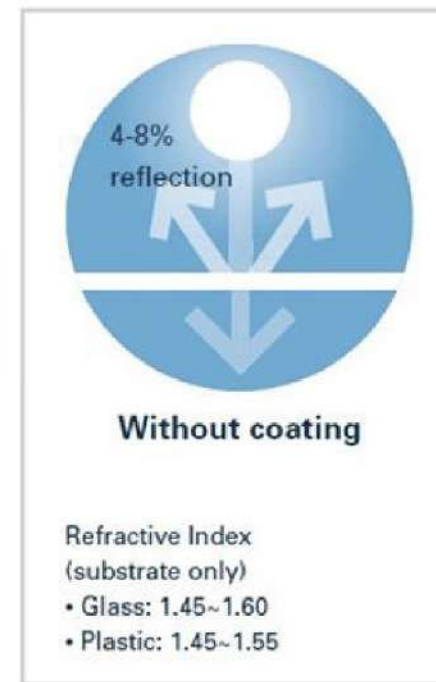
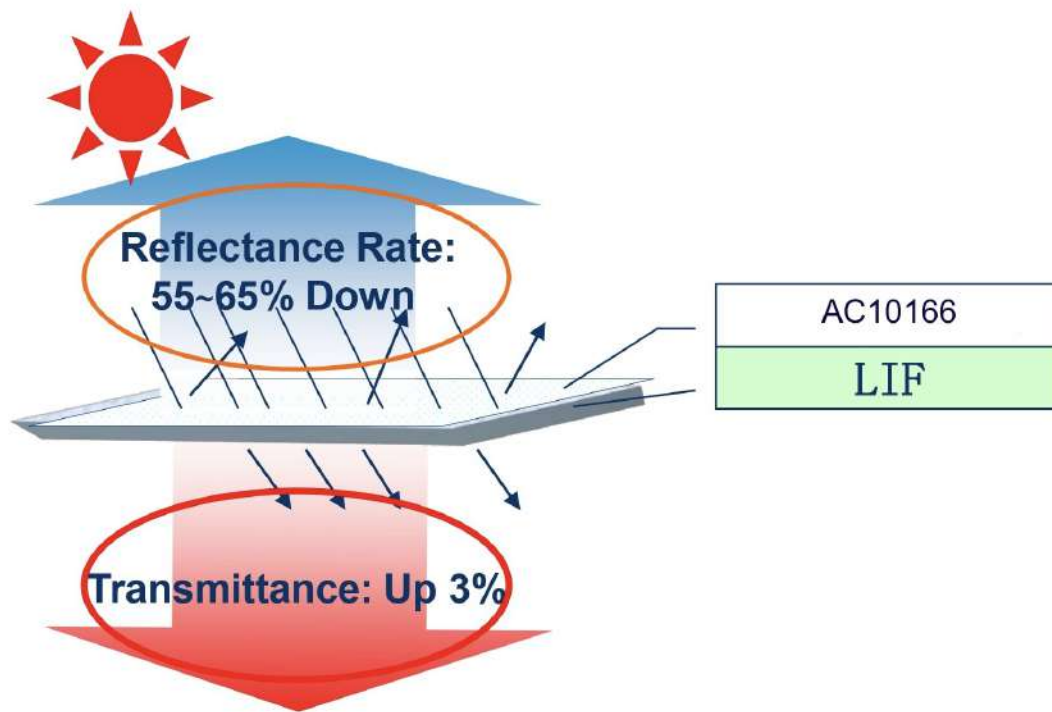
(above 25years, same as solar cell)

AR Coating for Solar Glass

Light transmittance Increase about 3%—increasing power by 2.7~2.8%

Self cleaning effect : increasing power by 5% in Outdoor

Reflective rate decrease by 4~5%



Introduction of PV-Series

Principal concept of our products is to provide porous structure on the surface of PV glass for trapping the sunlight

Solar-Max

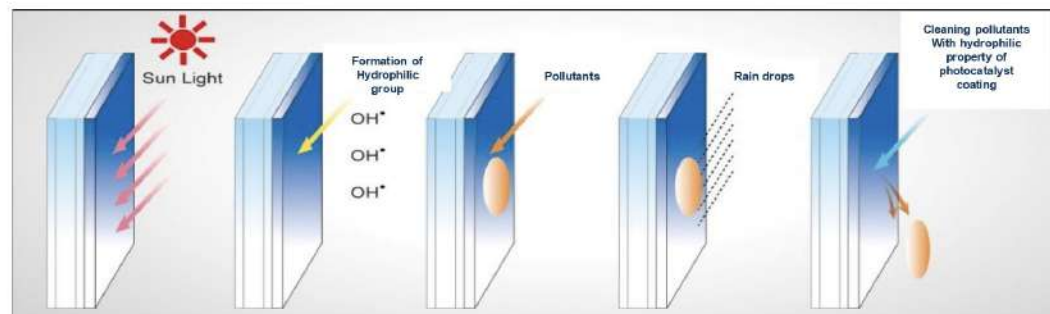
AC10166 Solar

It is designed for Maximum Light Transmittance Increase with Excellent Performance even at High Temperature of

Sol-Clean

AC10166 Solar

It includes Photocatalytic Performance having Self-Cleaning Effect, with Light Transmittance increase
This Grade is useful for Already Installed Solar Power Station.



→ Elimination of Contaminant by hydrophilicity

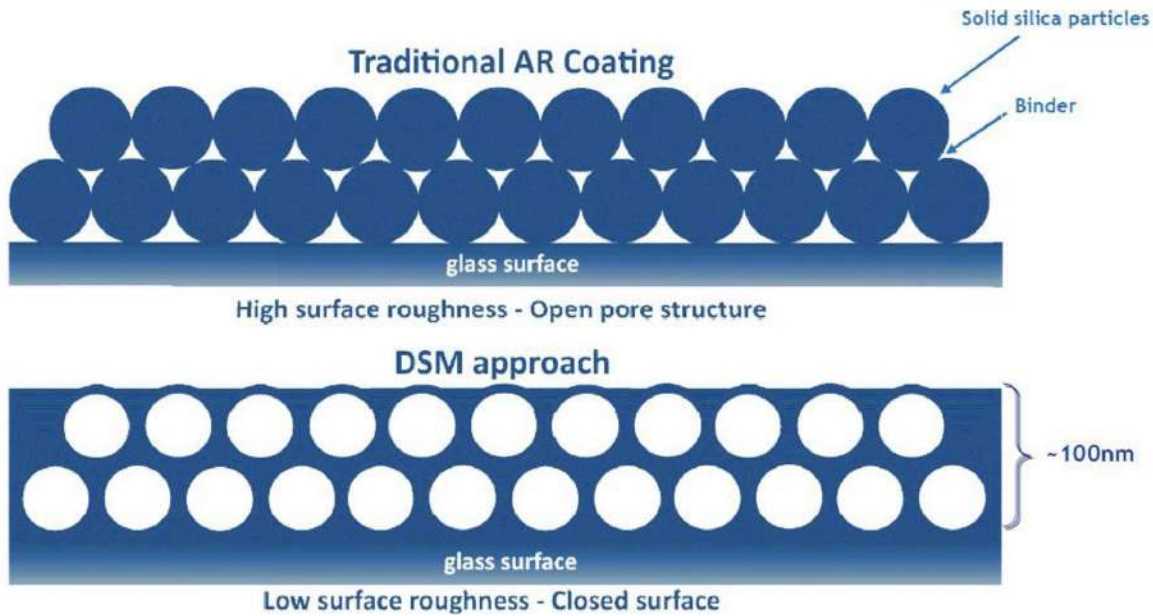
Performance – PV-Series

* PV-Series for Low Iron Glass (LIF Type).

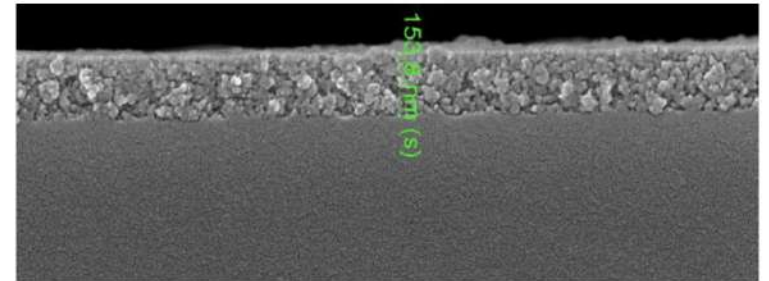
Grades	Increased Transmittance		Coating Method
	380~850nm (T%)	Power Generation (P%)	
Solar-Max AC10166	3.2	2.7 UP	Roll
Sol-Clean AC10166	2.4	2.0 UP	Spray

Cross Cut of Solar Glass After AR AC10166 Coating at 730 C

Single Layer Antireflective Coatings: Traditional vs. Core-shell AR Coatings

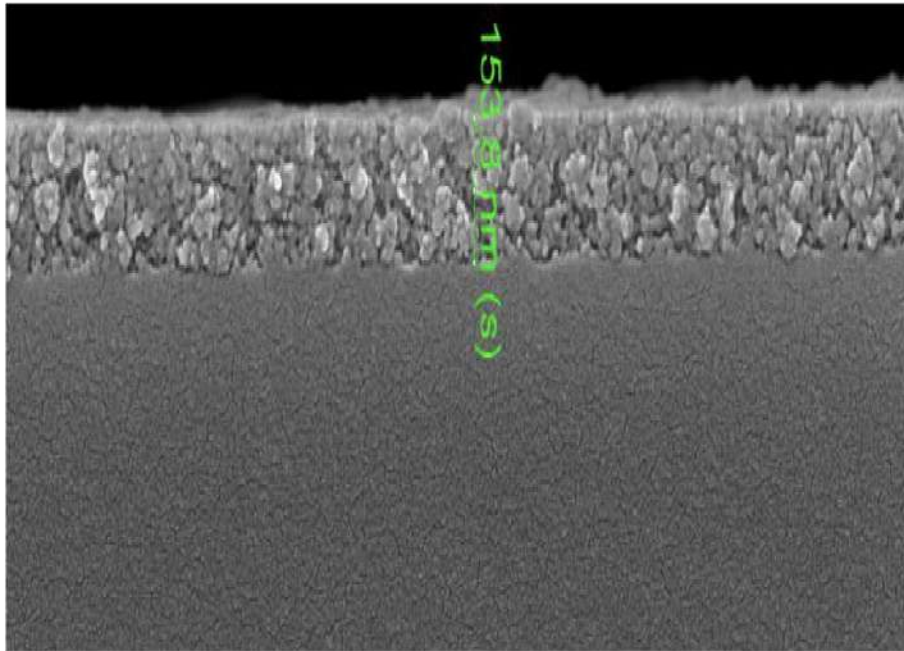


FE-SEM after AR coating using AC10166

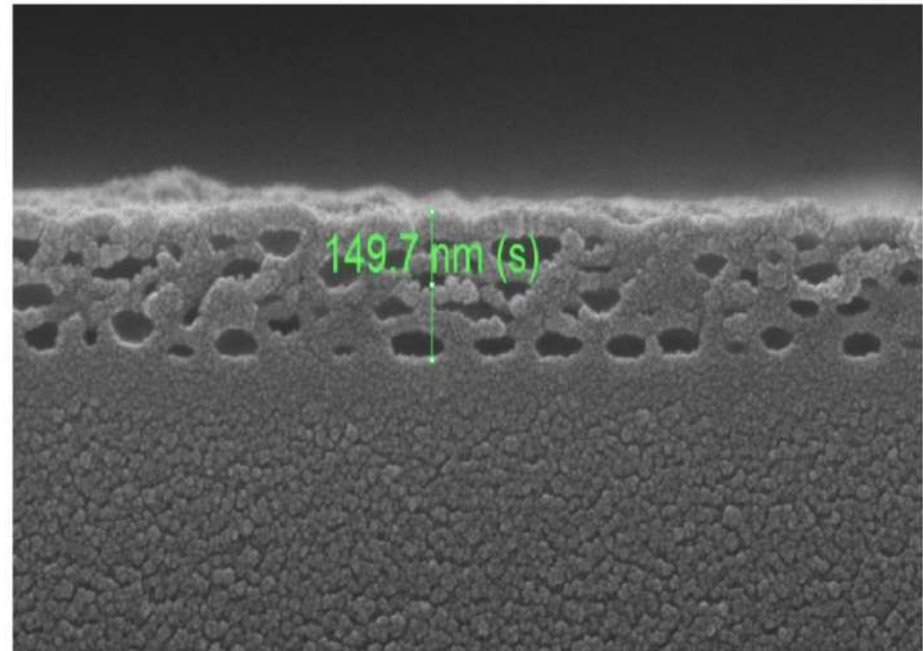


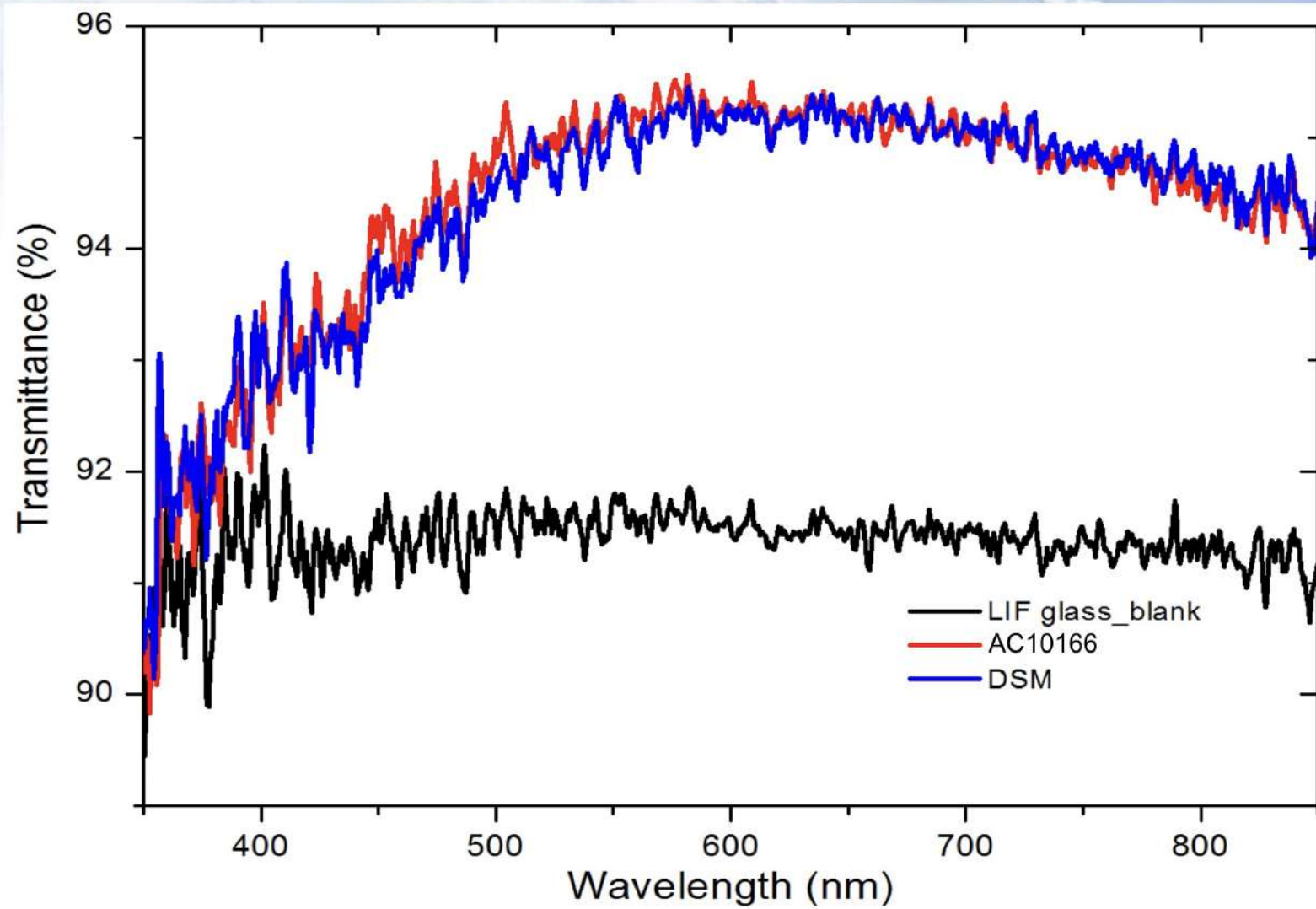
Comparison of Cross Section after AR Coating

A) FE-SEM of AC10166 Allcera

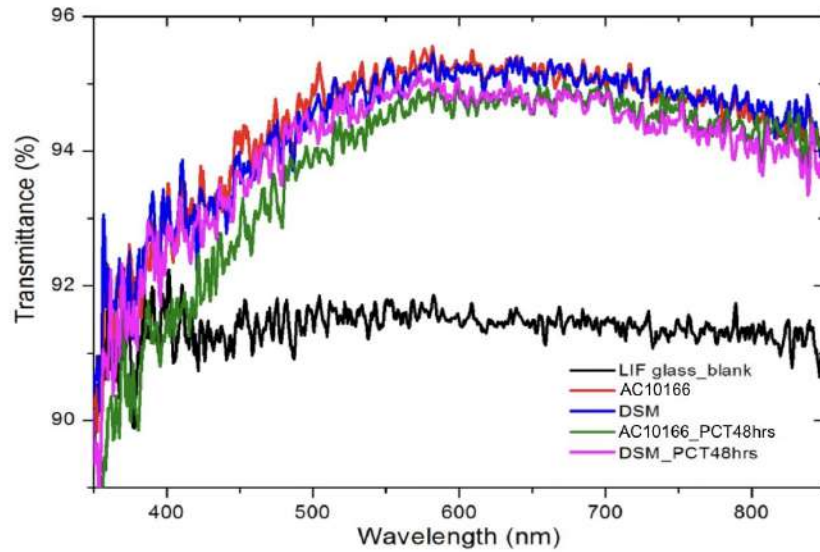
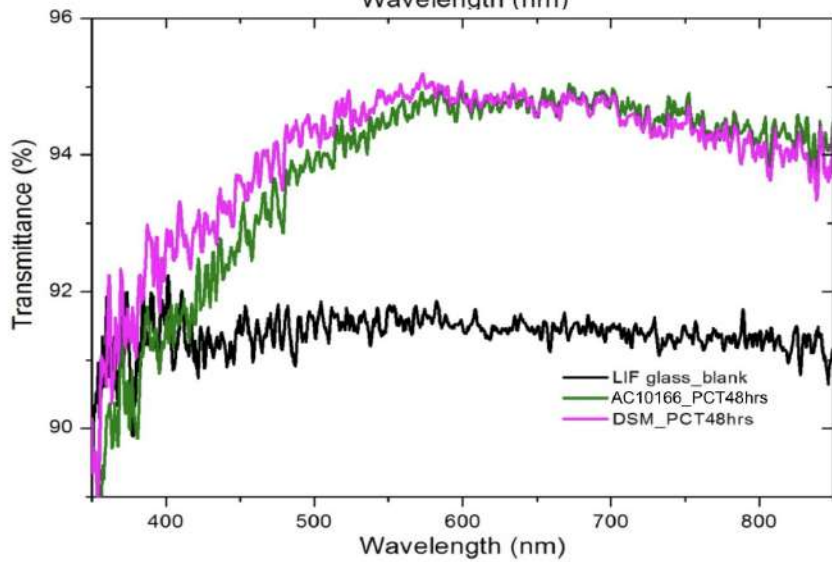
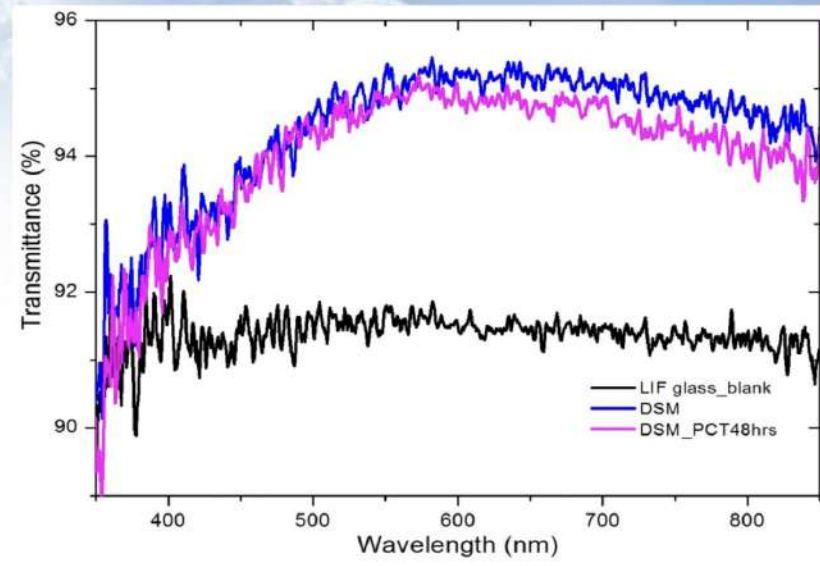
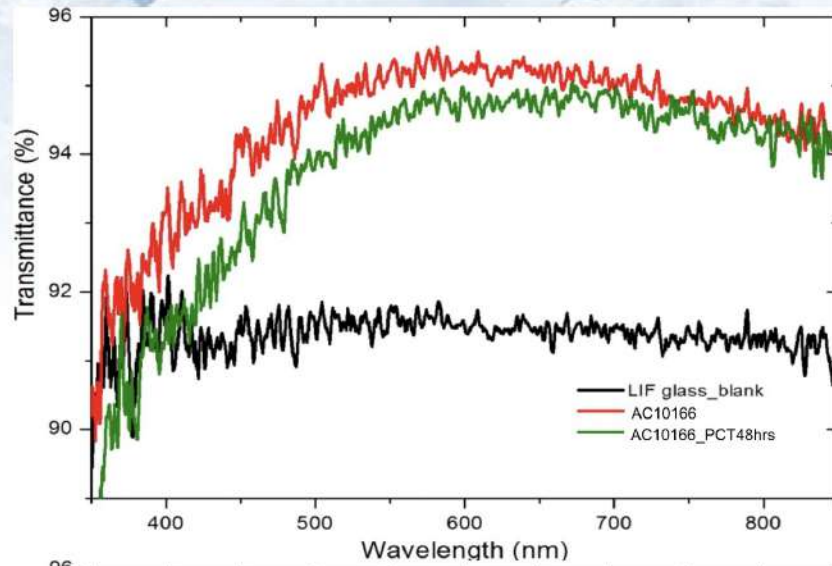


B) FE-SEM of Khepricoat (DSM)





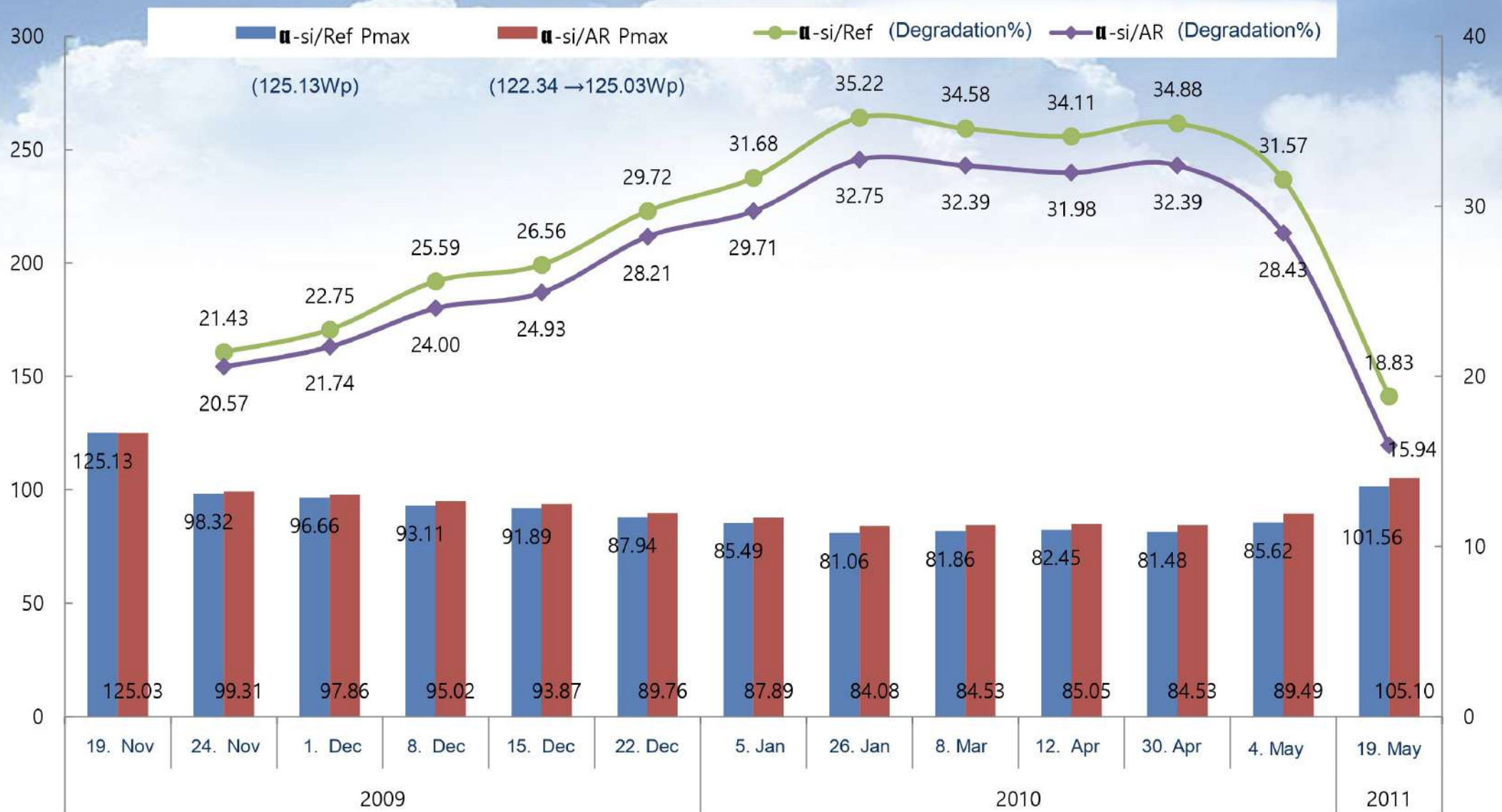
Comparison of PCT Test between Allcera and DSM



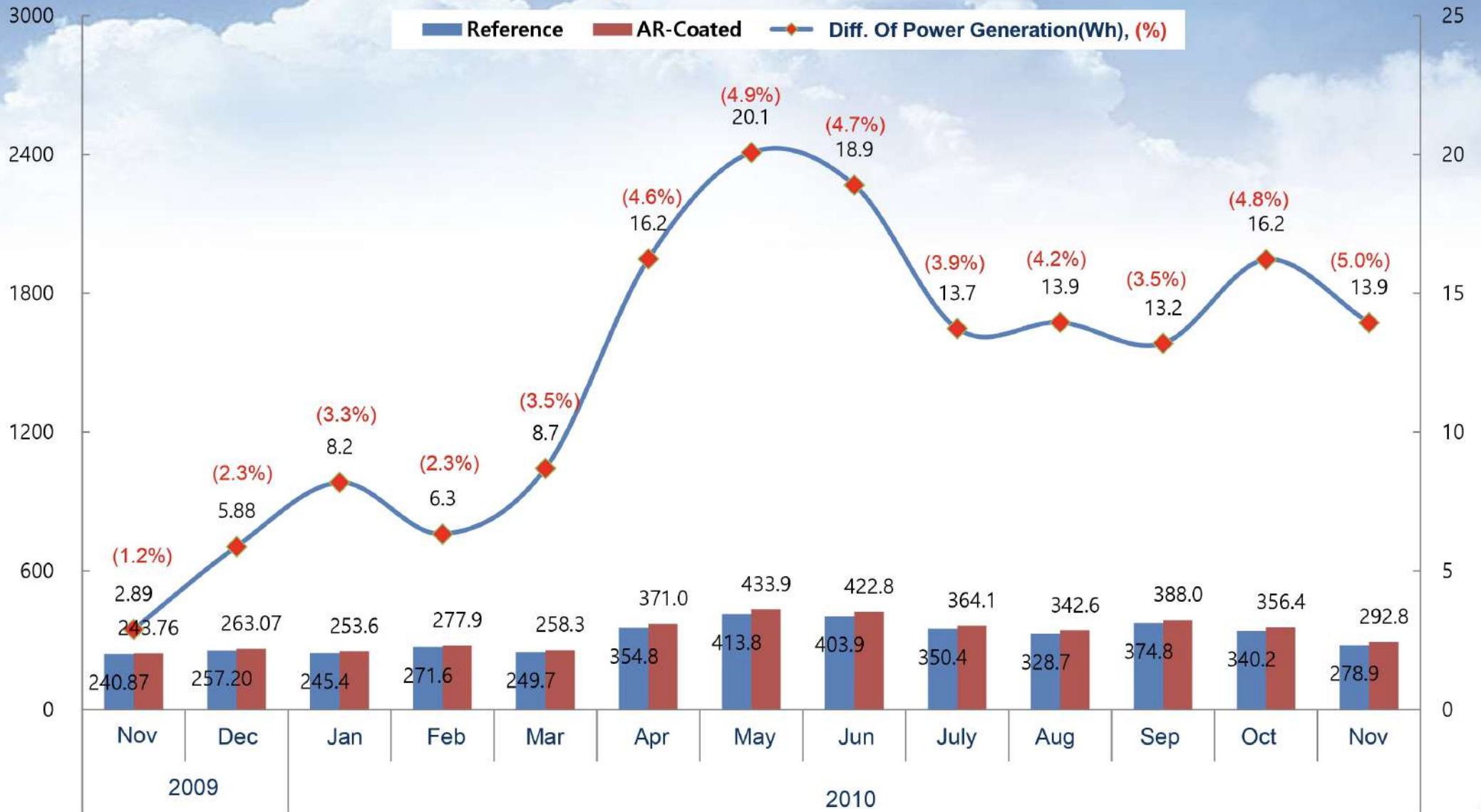
The Change of Transmittance after PCT Test

NO.	NAME (Grade)	Before PCT Test	After PCT Test	Difference of Transmittance	Kim wipers Test (50 cycles)
		T(%)	T(%)	T(%)	
1	Allcera ACI0166	94.59	94.14	-0.45	Good
2	DSM Khepricoat	94.55	94.19	-0.36	Good

Improved degradation effect by anti-reflective coating



Improved power generation by anti-reflective coating



Reliability Test of Allcera ACI0166 Solar

* Module test by IEC 61215 Methods

Item	Condition	Results
Damp Heat Test (or PCT Test)	Temp:85C, RH:85%, 2,000hrs (120Cx2atmx48hrs)	Pass
UV-Test	25mW/cm ² ,60hrs	Pass
Temperature cycle Test	-40C +85C, 50 cycle	Pass
Humidity freeze Test	85%, 40C +85C, 10 cycle	Pass
Hail Test	25mm, 7,5g, 23m./2.,, 11 cycle	Pass

* Chemical resistance test & Durability

Item	Condition	Results
QUV	0.67W/m ² , 4400hrs	Pass
Acid dip Test	H ₂ SO ₄ (5%), 80days	Pass
Salt spray Test	IEC 61701	Pass
Salt dip Test	NaCl(5%), 3days	Pass
Pencil Hardness Test	ISO15184 (2007)	4H<
Cross Cut	ISO 2409 (2007)	Pass
Adhesion Test	ASTM D3002(1.0mm,10*10)	Pass
Abrasion Test	500g * 300 cycle	Pass

Product – Photo-catalyst



R&D Part

- Increased photocatalytic activity by 5~10 times more than conventional TiO₂
- Photocatalytic **activity increased in visible ray** as well as in UV
- Development of New concept photocatalytic material (Bi₂O₃/BiOCl/WO₃, TiON/WO₃, TiON/Pt, etc.)
- Use of inorganic binder **harmless to human body**
- Functional Photocatalyst

Business Scope

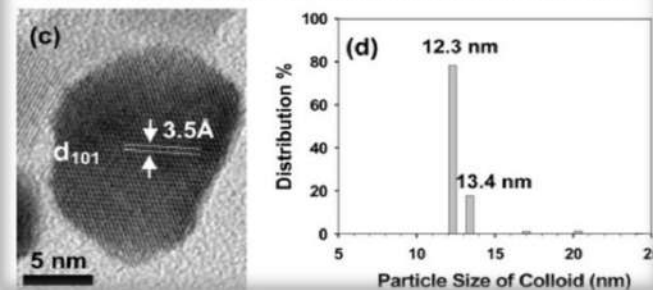
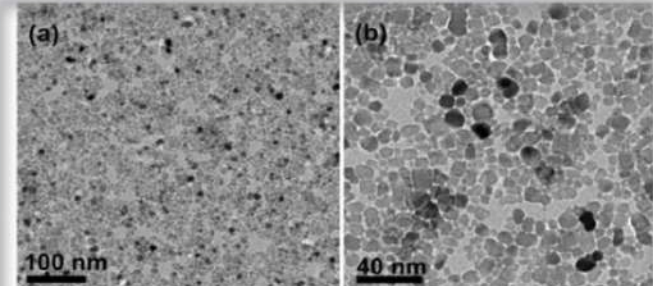
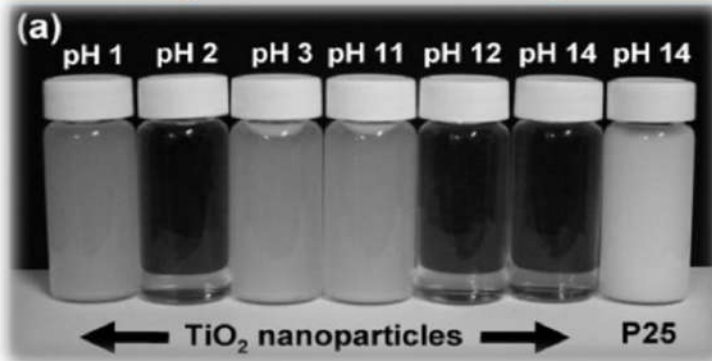
The core technology of Nano-materials

- TiO_2 Nano Particle composition solution technology under super-hydrophilicity
- Accumulated Know-how in composition mechanism of TiO_2 Nano particles and structure

Ti-Alcoxide,
Amine,
Alcohol

Hydrothermal
reaction

Super -
hydrophilicity
 TiO_2 Nano
Particles

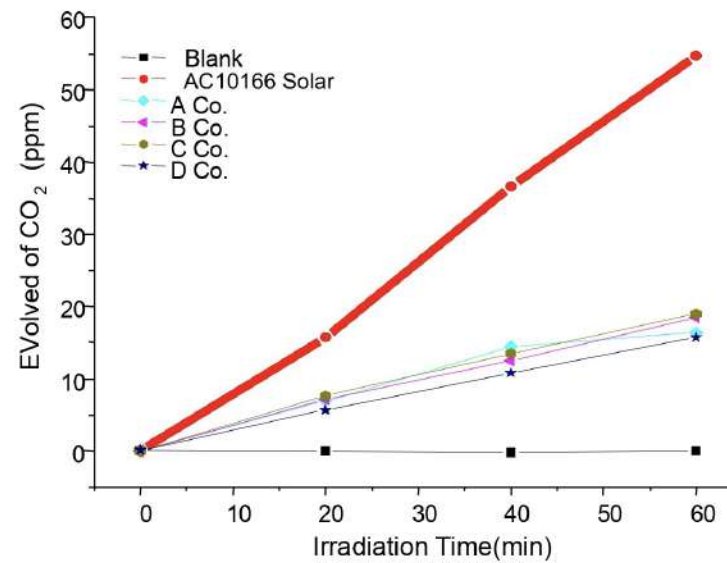
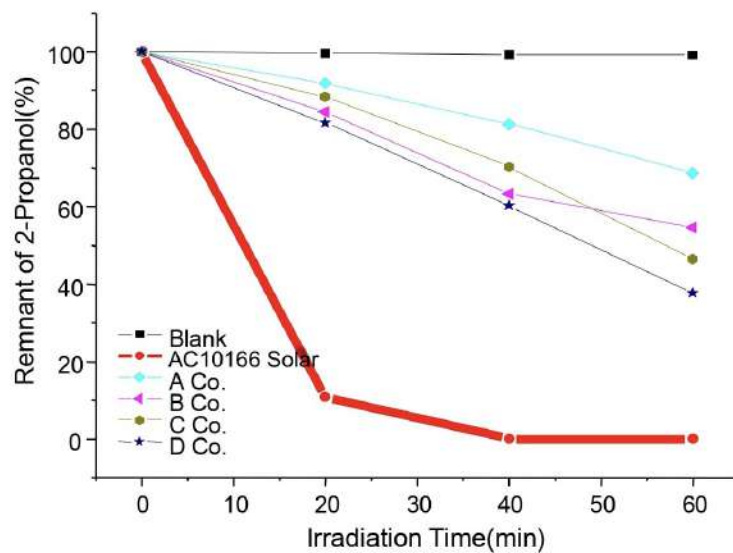


Photocatalyst:

Reductive Energy Storage Photocatalyst

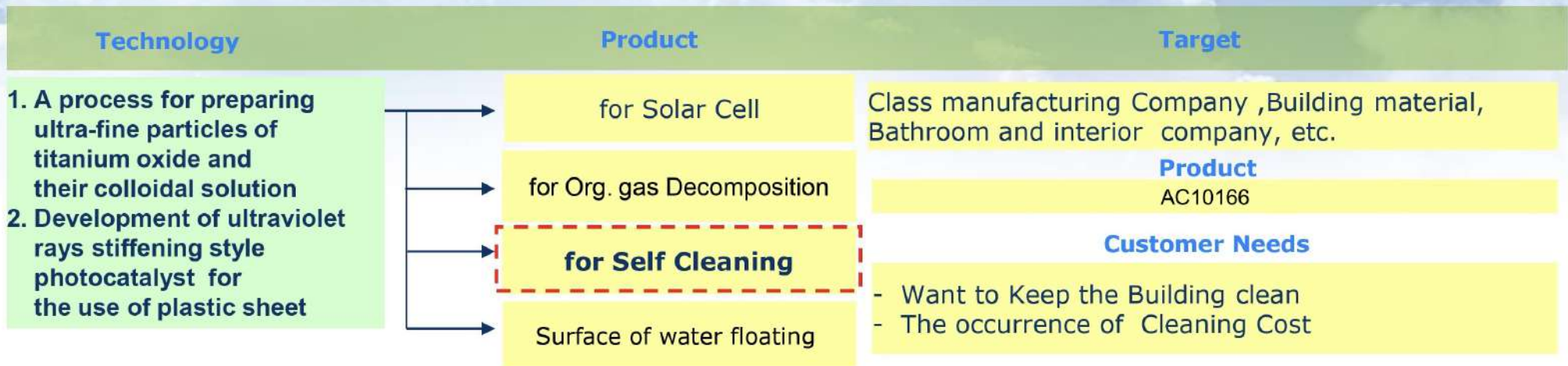
- Electron storage effect: Activity remains for 4 hours without light
- Extended active wavelength from UV to visible range
- Strengthened organic gas absorption and decomposition capability
- Anti bacteria activity
- Eco friendly ambient temperature binder
- Waterborne emulsion

*Comparison between typical TiO_2 and $\text{WO}_3\text{-TiO}_2$



Decomposition of 2-Propanol

Product – Photocatalyst

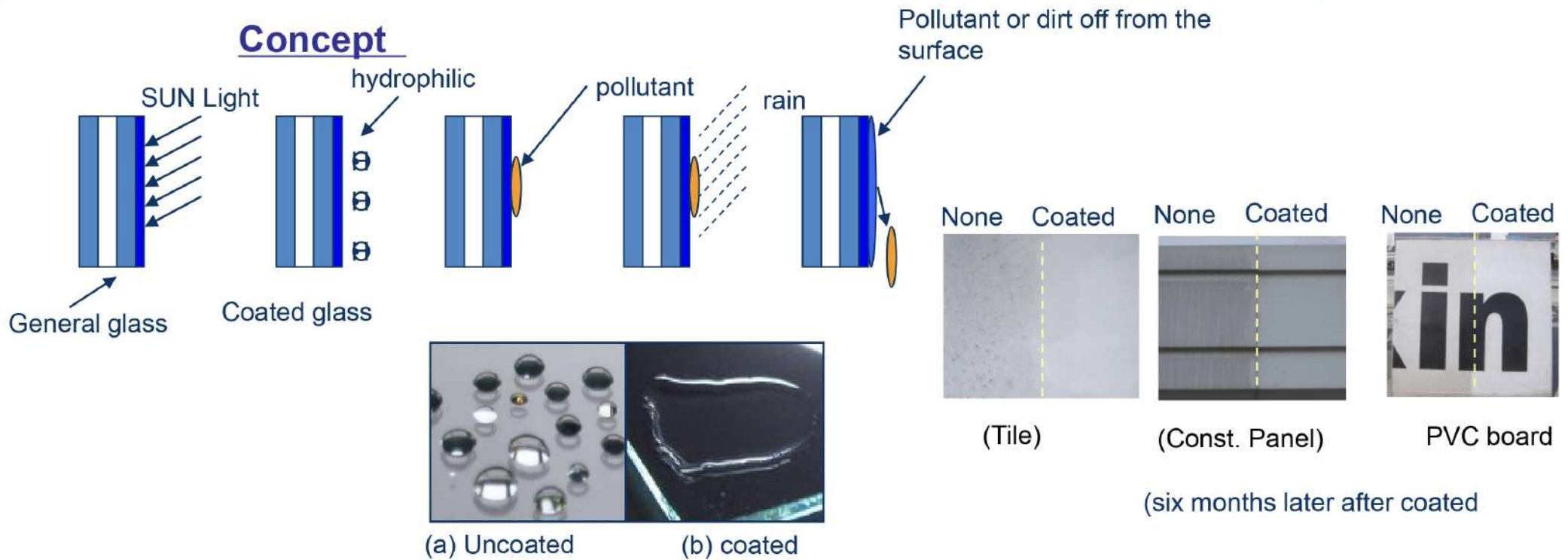


R&D Part

- Optimizing development of according to photocatalyt materials
- Completion of Coating Line equipment
- Adhesiveness more than 7H, Good durability products development.

Photo-catalyst:

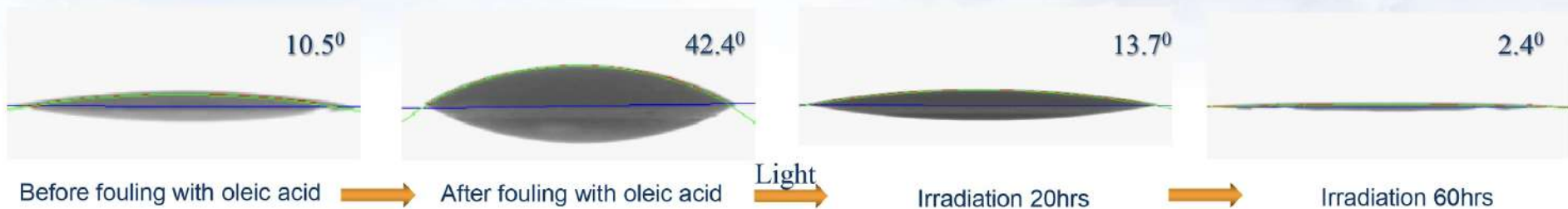
Super hydrophilic property – Keep clean the surface of glass and building from the pollutant or dirt with very natural resources of sun light and rain or water



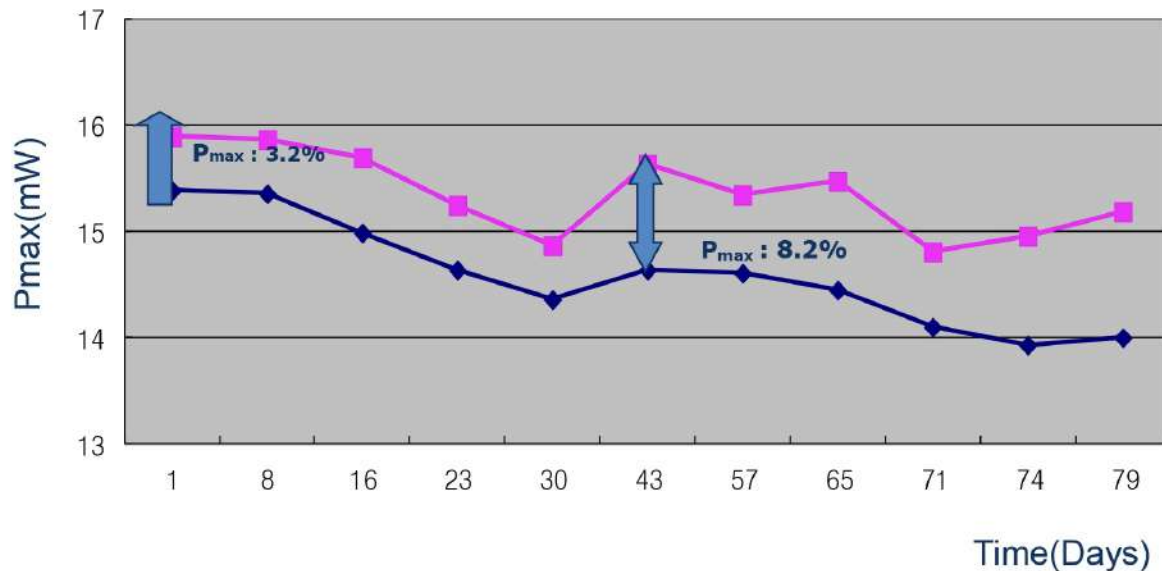
Special Performance

* **Increased power generation by 5% up by Self-cleaning effect**

* Photo-decomposition of Oleic Acid



* Measurement of Power Generation by Self-cleaning Effect



* Test conditions

- Material Mist low iron glass (no coating vs coating)
- Condition : outdoor exposure
- Period 10 weeks

Increased power generation by 5% up by Self-cleaning effect