



Vivion™

cyclic block copolymers

Enable Unlimited Possibilities



2 Key Technologies

Complete Hydrogenation

- Efficient complete-hydrogenation
- Ensured product quality

Anionic Polymerization

- Precisely controlled molecular weight
- Extremely low extractables



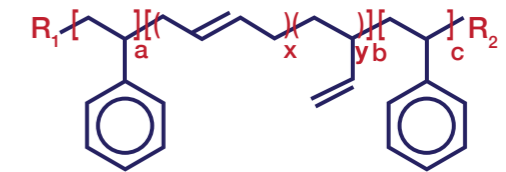
ViviOn™

Cyclic Block Copolymers (CBCs)

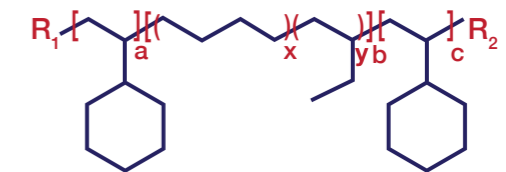
ViviOn™ is a family of novel cyclic block copolymers (CBCs), which are fully hydrogenated polymers based on styrene and conjugated dienes via anionic polymerization. This advanced material has remarkable thermal stability, excellent UV durability, extra-high transparency, low water absorption, low density and superb purity. These features offer the users of ViviOn™ with superior design flexibility, easy processing capability and low life-cycle costs. In addition, the flexibility of tailoring polymer micro-structure by adjusting the ratio of poly(cyclohexylethylene) (PCHE) and ethylene-co-1-butene (EB) provides ViviOn™ a wide range of properties from rigid plastics to soft elastomers.

Complete Hydrogenation Technology

Styrene-Butadiene Copolymers



Cyclic Block Copolymers



USI Corporation, one of the largest polymeric material companies based in Taiwan, has a long history in producing and selling PE and EVA. The company acquired the CBC technology from Dow Chemical Co. in 2011 and initiated the world's first-ever CBC mass production line in Kaohsiung, Taiwan.



For more information, please refer to www.usife.com

1995
Initiated by Dow Chemical Co.

2000
Fundamental research

2005
Application development

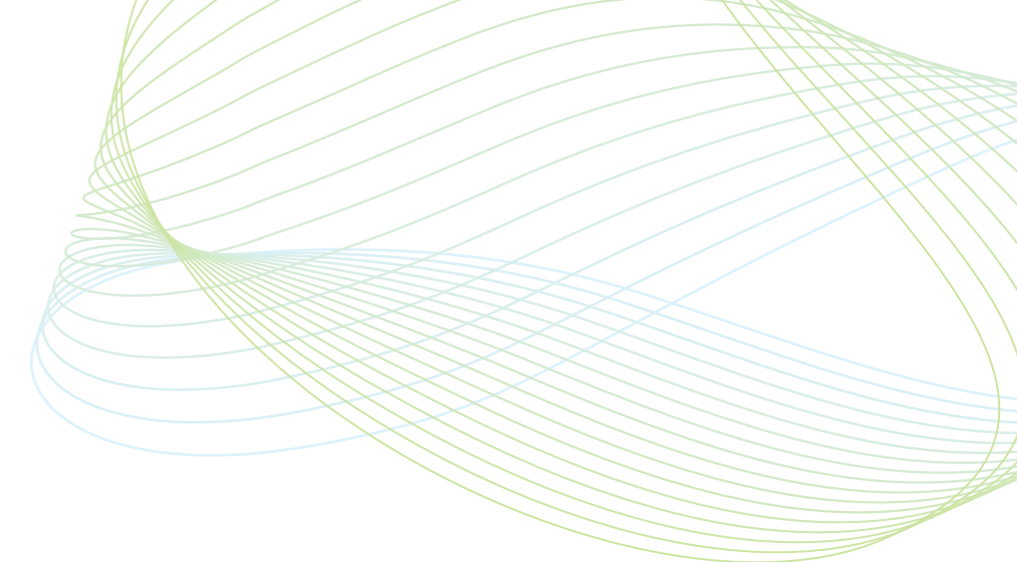
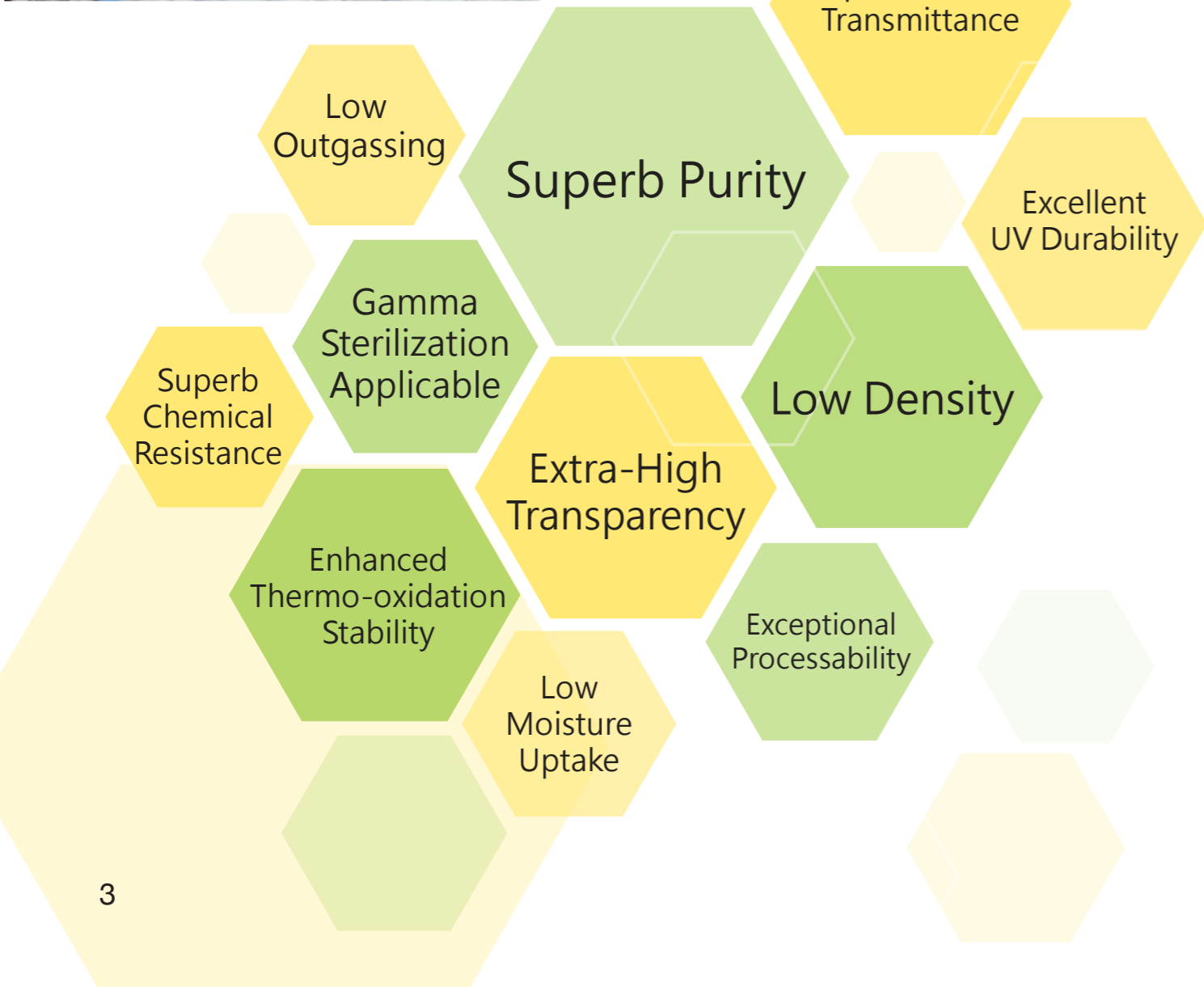
2011
USI - Technology acquisition, product research and market development

2018
USI initiated the world's first-ever CBC mass production line in Kaohsiung, Taiwan



Vivion™

Cyclic Block Copolymers (CBCs)



Vivion™ Properties

Properties	Unit	Test Method (ASTM)	Vivion™ 8210	Vivion™ 1325	Vivion™ 0510
General Properties					
Density	g/cm ³	D792	0.94	0.94	0.94
Water uptake	%	D570	<0.01	<0.01	<0.01
Melt flow rate (2.16kg, 260°C)	cm ³ /10min	D1238	200	7	4.5
Optical Properties					
Transmittance (3mm)	%	D1003	92	92	92
Haze (3mm)	%	D1003	<0.5	<0.5	<0.5
Reflective index	-	-	1.51	1.51	1.51
Thermal Properties					
Vicat softening temperature (1kg, 50°C/hr)	°C	D1525	104.7	126	114.1
Heat distortion temperature (0.455MPa, 2°C/min)	°C	D648	82.8	102.5	94.1
Mechanical Properties					
Flexural strength	MPa	D790	63.7	70	58.5
Flexural modulus	MPa	D790	2120	2400	1710
Tensile strength (Y.P.)	MPa	D638	36.3	40.6	34.9
Tensile strength (B.P.)	MPa	D638	39.3	43.6	41.5
Elongation	%	D638	14.7	24.4	29
Izod impact strength	kg-cm/cm	D256	2.5	3.6	4.1

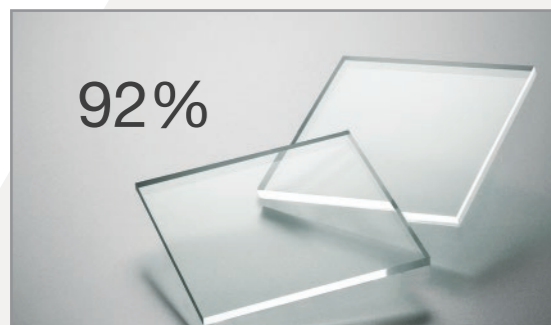
Please contact us to obtain information on other Vivion™ grades.

Optical Applications

Improved brightness, clarity and viewing angle for your display

ViviOn™ is an innovative optical polymer with characteristics of low density, extra-high transparency, well-controlled light retardation, excellent UV durability, great chemical resistance, and low moisture uptake. Due to the unique chemical micro-structure, ViviOn™ can be processed advantageously in most optical fabrications including injection molding, extrusion and solvent casting.

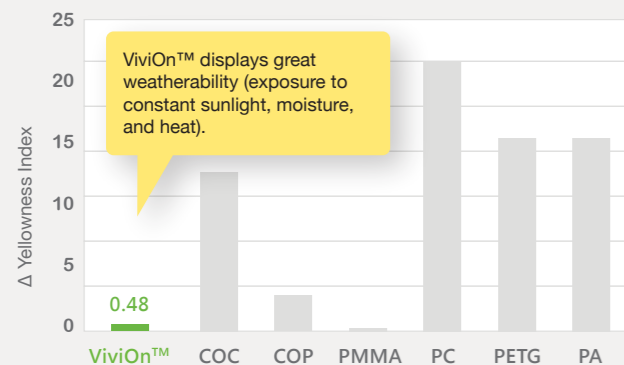
Superior High Transparency



Low Density

ViviOn™	0.94
COC	1.01
COP	1.01
PMMA	1.19
PC	1.20
PET	1.37

Excellent Weatherability / UV Durability



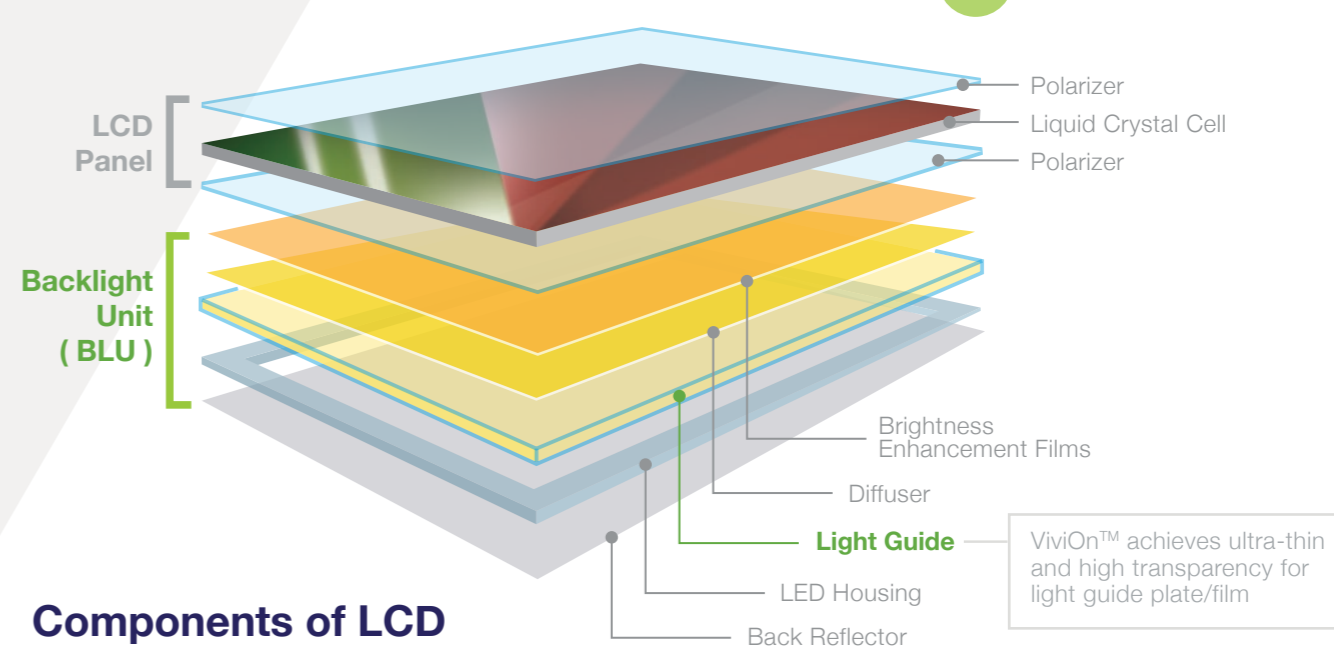
ViviOn™ displays great weatherability (exposure to constant sunlight, moisture, and heat).

•ASTM G154
Wavelength : UVA 340 nm
Irradiation : 0.89 W/m²
Test duration: 1000 hrs
Each cycle include 8 hrs of UV exposure with uninsulated black panel temperature (60±3°C) and 4 hrs of condensation with uninsulated black panel temperature (50±3°C).

Outstanding Thermal Stability

Time / Materials	ViviOn™	COC	COP
0.5h			
1.0h			

At 250°C oven, air



Components of LCD

Thinner & Brighter

Medical Applications

Pure & Clean: An extremely clean and trustworthy material for medical devices

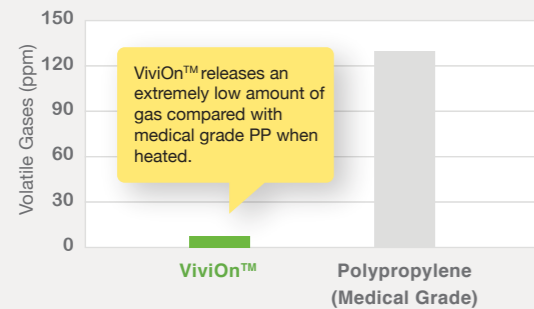
ViviOn™ is safe, reliable and durable for medical applications with features of extreme purity, good thermal stability, excellent UV durability, superb chemical resistance and outstanding clarity. The products made by ViviOn™ can be sterilized using ethylene oxide (EtO), Gamma and e-beam radiation, providing medical professionals ease of use and compatibility.

Vivion™ passes selected chapters of ISO10993 biocompatibility, US Pharmacopeia <88> Class VI and <661>, as well as JP Pharmacopeia 7.02. The application for FDA Type III Drug Master File registration is registered.



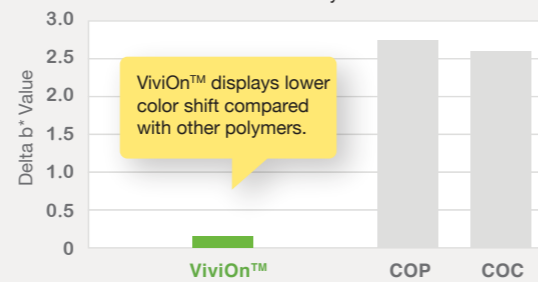
Extremely Low Outgassing

Test condition: heat at 80°C for 2hrs, then measure volatile gases by headspace GC/MS.



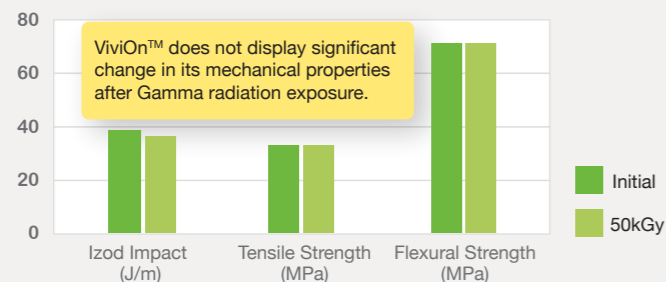
Low color shift after Gamma irradiation

Degree of color shift after exposure to 50kGy of Gamma radiation then settled for 1 day.



Mechanical properties after Gamma irradiation

Mechanical properties were measured before and after 3 weeks of Gamma irradiation.



Regulations	Items	Results
ISO 10993	<ul style="list-style-type: none"> · Cytotoxicity · Sensitization · Irritation reactivity 	Passed
US Pharmacopeia <88> Class VI	<ul style="list-style-type: none"> · Acute System Test · Intracutaneous Test · Implantation Test (7 days) 	Passed
US Pharmacopeia <661>	<ul style="list-style-type: none"> · Non-Volatile Residue · Heavy Metals (as Pb) · Buffering Capacity 	Passed
Japan Pharmacopeia 7.02	<ul style="list-style-type: none"> · Residue on ignition · pH value · UV spectrum · Foaming test · Heavy metals (Pb, Cd, Sn) · KMnO₄ reducing substances · Heavy metals (as Pb) · Residue on evaporation 	Passed
EU REACH	161 Substances of Very High Concern Test	Not detected
BPA Test	BPA-free Test	Not detected
FDA Drug Master File	Drug Master File with U.S. Food and Drug Administration (DMF #32470)	Registered





Bio-diagnostic Applications

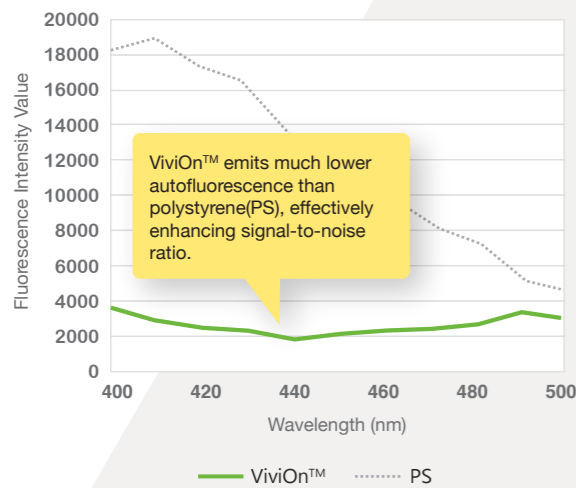
Accurate & Reliable: The material-of-choice for bio-diagnostic devices

ViviOn™ presents extreme cleanness and exceptional performance in its optical properties: higher UV transmittance and lower autofluorescence than other plastics to increase the accuracy and reliability of the analysis.

Applications include: cuvette, microplate and microfluidic chip (bio-chip) for UV and/or fluorescence detection.

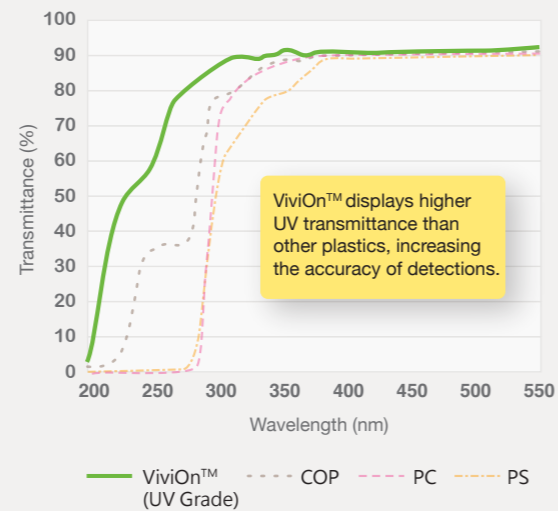
Low Autofluorescence

Excitation: 350 nm, sample thickness: 1 mm



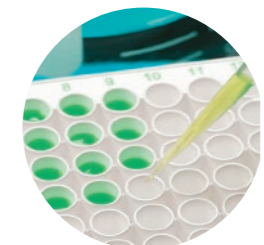
High UV Transmittance

Sample thickness: 1 mm



	Solvent	Resistance
Acid	Hydrochloric acid 36%	○
	Sulfuric acid 40%	○
	Acetic acid > 94%	○
	Nitric acid 65%	○
Alkali	NaOH 50%	○
	Ammonia solution 35%	○
Alcohol	Methanol	○
	Ethanol	○
	Isopropanol	○
Ketone	Acetone	○
	Methyl Ethyl Ketone	○
Hydrocarbon	Hexane	✗
	Baby oil (mineral oil)	✗
Others	DMSO	○
	Silicone oil	○
	Ethylene glycol	○

ViviOn™ resin & tensile bar specimen were immersed in the chemical or reagent for 2 days at room temperature, the specimen's weight loss and mechanical reduction were then measured. Resistant (○): weight loss < 1% and elongation at break% did not change significantly; Not Resistant (✗): weight change >5% or elongation at break% reduced by > 50%.



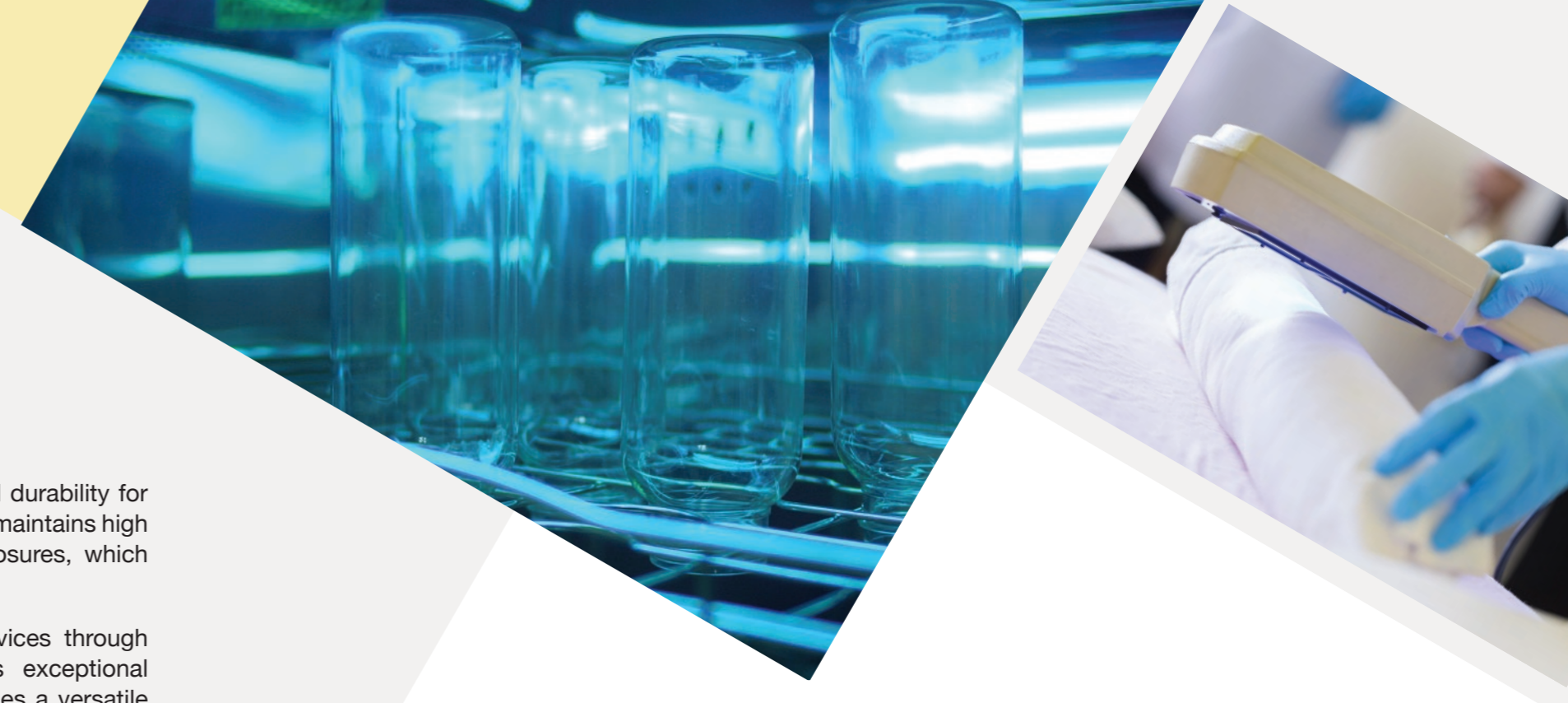
Accurate & Reliable

Deep Ultraviolet (UVC) Applications

Exceptional processability for a safe disinfection device

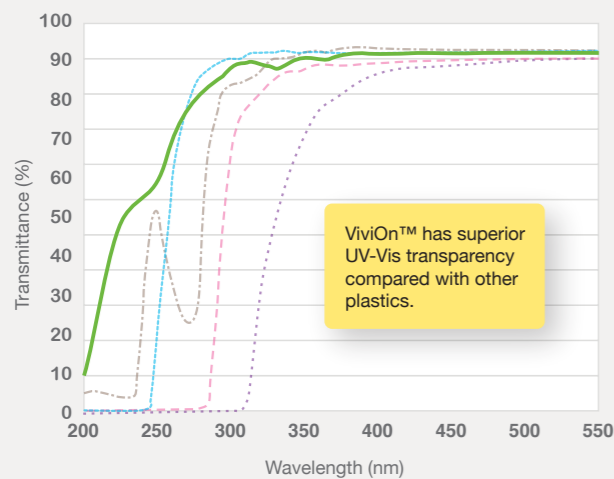
ViviOn™ is a medical grade plastic material with high UVC transmittance and durability for deep ultraviolet (UVC) applications. In comparison with other plastics, ViviOn™ maintains high UVC transmittance and a glass-like appearance under long-term UVC exposures, which makes it a suitable choice in disinfection applications.

ViviOn™ can be fabricated into sheets and parts for UVC disinfection devices through conventional processes, e.g.: injection molding, extrusion, etc. With its exceptional processability, superior chemical resistance, and low density, ViviOn™ provides a versatile flexibility in product design.



High UVC Transmittance

Sample thickness: 1 mm



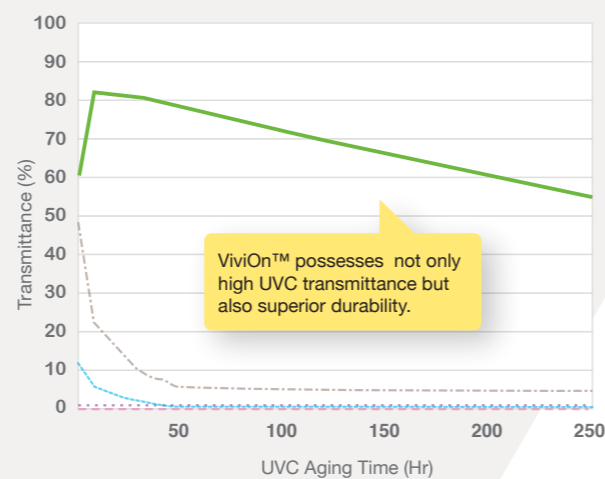
ViviOn™ has superior UV-Vis transparency compared with other plastics.

— ViviOn™ (UV Grade) — PC — PMMA — PETG — PP

Substantial UVC Durability

UVC Transmittance @ 250 nm

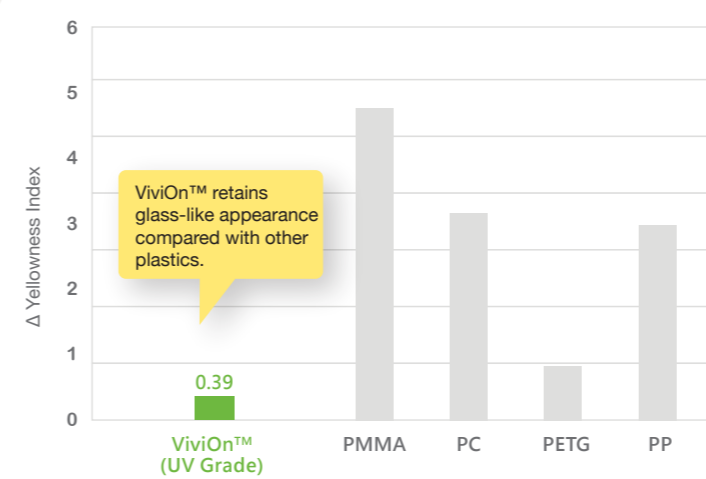
UVC source: Philips TUV 15W T8 x 4 sets (Wavelength: 253.7 nm)
UVC aging time: 250 hrs, Distance: 40 cm, Sample thickness: 1 mm



ViviOn™ possesses not only high UVC transmittance but also superior durability.

Low color shift after long-term exposure to UVC

UVC source: Philips TUV 15W T8 x 4 Sets (Wavelength: 253.7 nm)
UVC aging time: 250 hrs, Distance: 40 cm, Sample thickness: 1 mm



ViviOn™ retains glass-like appearance compared with other plastics.

High UVC Sterilization Efficiency

UVC Source: Philips 8W T5 (Wavelength: 253.7 nm)
Distance: 1.6 cm, Plate Thickness: 1 mm, Micro-organism: E. coli

Sterilization Time (s)	Amount of Bacteria (CFU/mL)	
	ViviOn™ (UV Grade)	PP
0 s	4.17 × 10 ⁵	4.17 × 10 ⁵
3 s	<10	6.25 × 10 ³

Utilizing plastic for UVC sterilization device (Ex: UVC source cover, container, etc.), ViviOn™ offers higher UVC sterilization efficiency.



Portable Disinfection Device



Baby Product



Home Appliances



Healthcare Disinfection



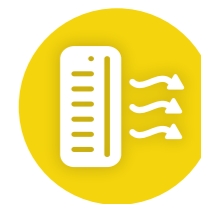
Food & Beverage Processing



Analytics & Diagnostic



Water Disinfection



Air Disinfection



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