

Korean Women Scientists and Engineers in Asia Pacific
KOWSEAP

Korea Federation of Women's Science and Technology Association
KOFWST



**Polarizing films
and pressure-sensitive adhesives**

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SAMSUNG SDI



Introduction

History of display technology

A liquid crystal display, or LCD, is the technology behind most monitors today. It relies on electrodes and polarizing filters enabling specific pixels to pass the light from a backlight source to the screen. Each pixel has 3 color sites and each of the sites has a color filter for red, green, or blue. This is the RGB matrix you've probably heard of and allows the plethora of colors on current devices.



TRS-80 video display (1977)



Sharp PC-1211 (1980)



IBM computer with a green monochrome monitor



Flat panel display



Car navigator, camera



High contrast ratio wide viewing angle



55" UHD Curvet TV HU7200



Samsung series 9 super slim notebook



Touch Technology



3 D



Transparent and foldable OLED

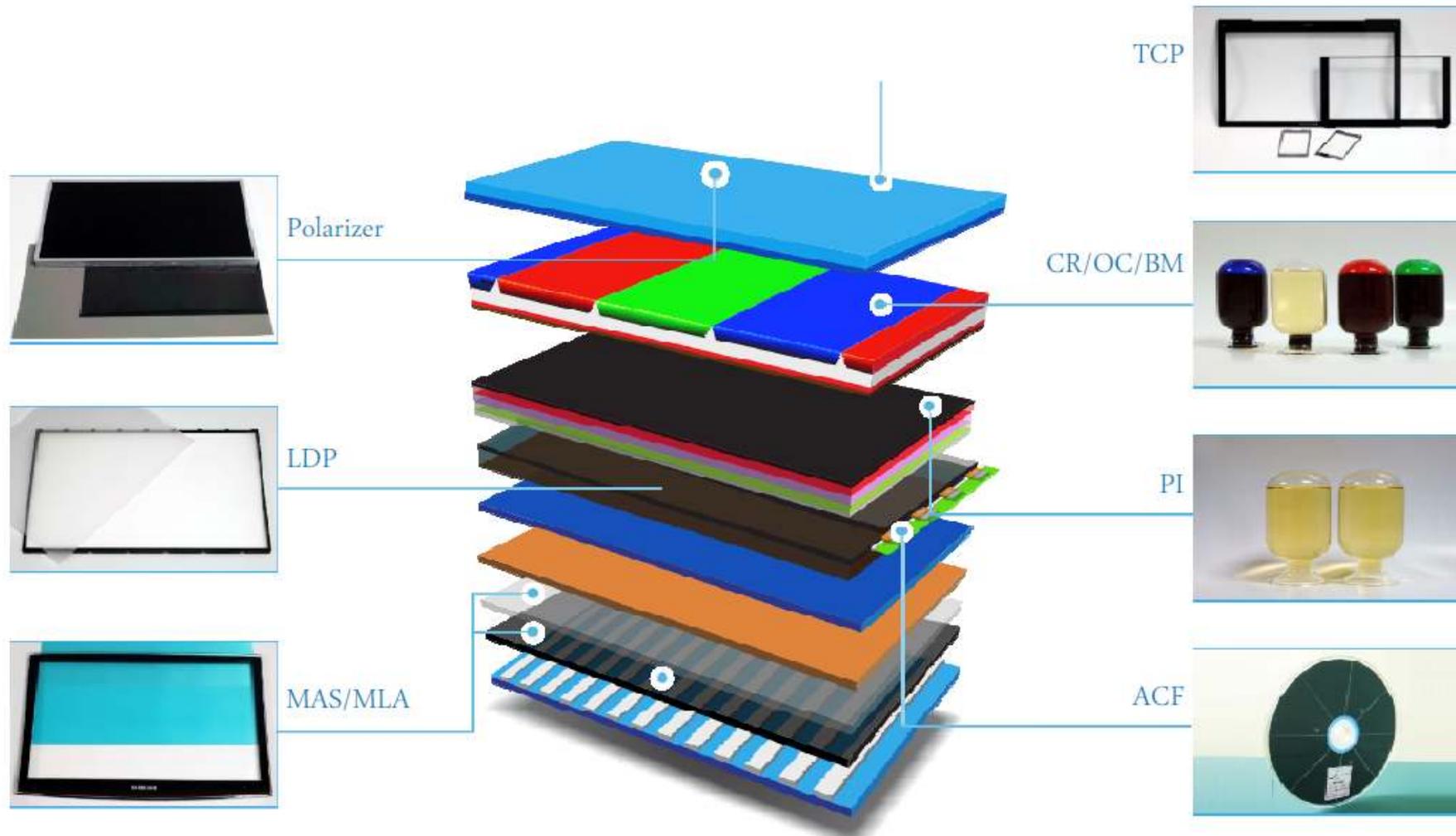


Flexible OLED



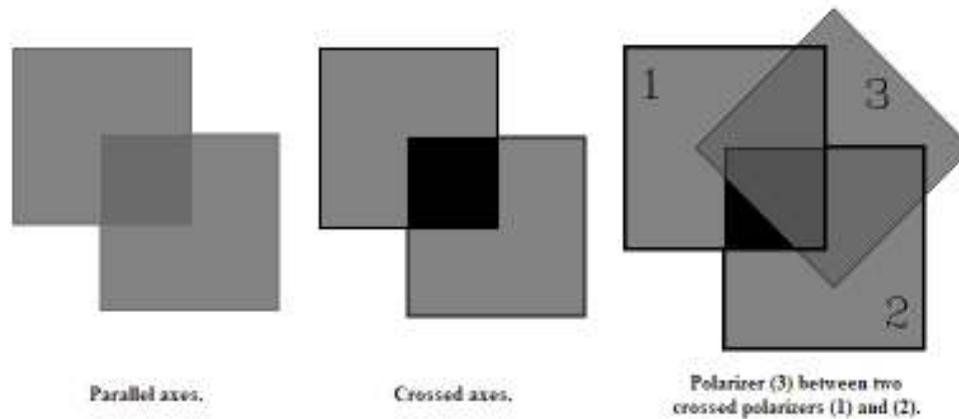
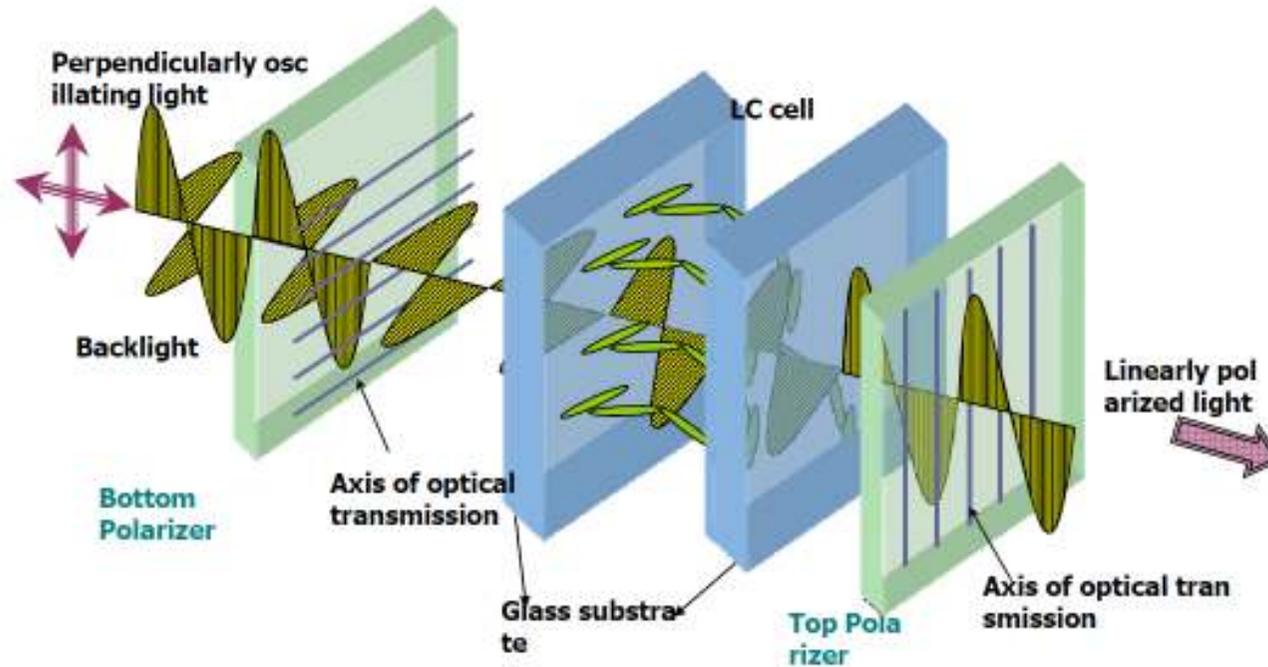
Display Materials Business

STAREM for Display (LCD)



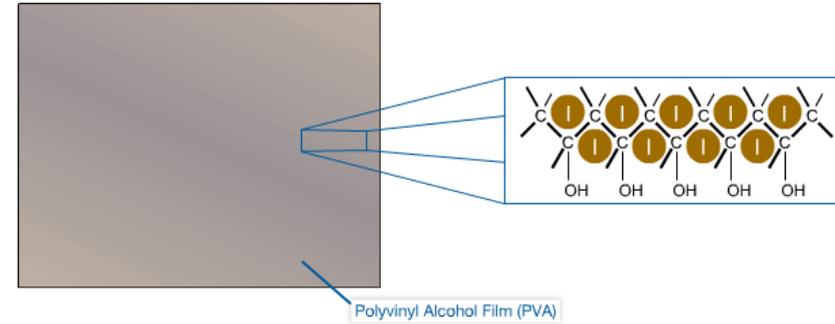
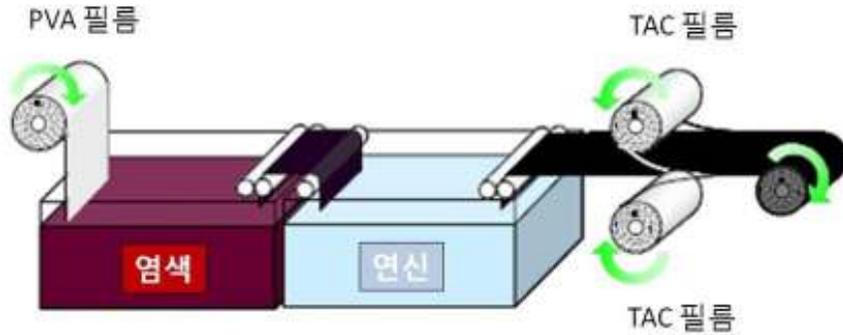


What is polarizer?





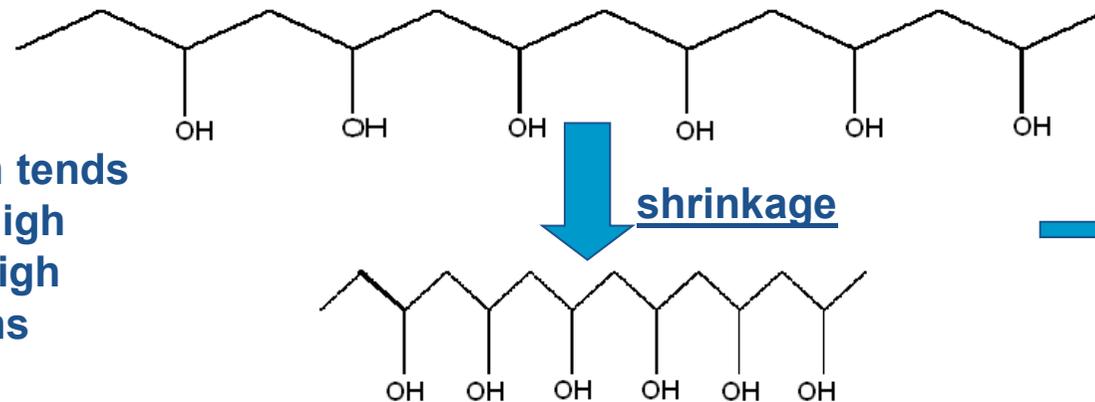
Iodine polarizer



Stretching of Polyvinyl Alcohol (PVA) Film

Doping of PVA Film with Iodine
99.99% efficiency

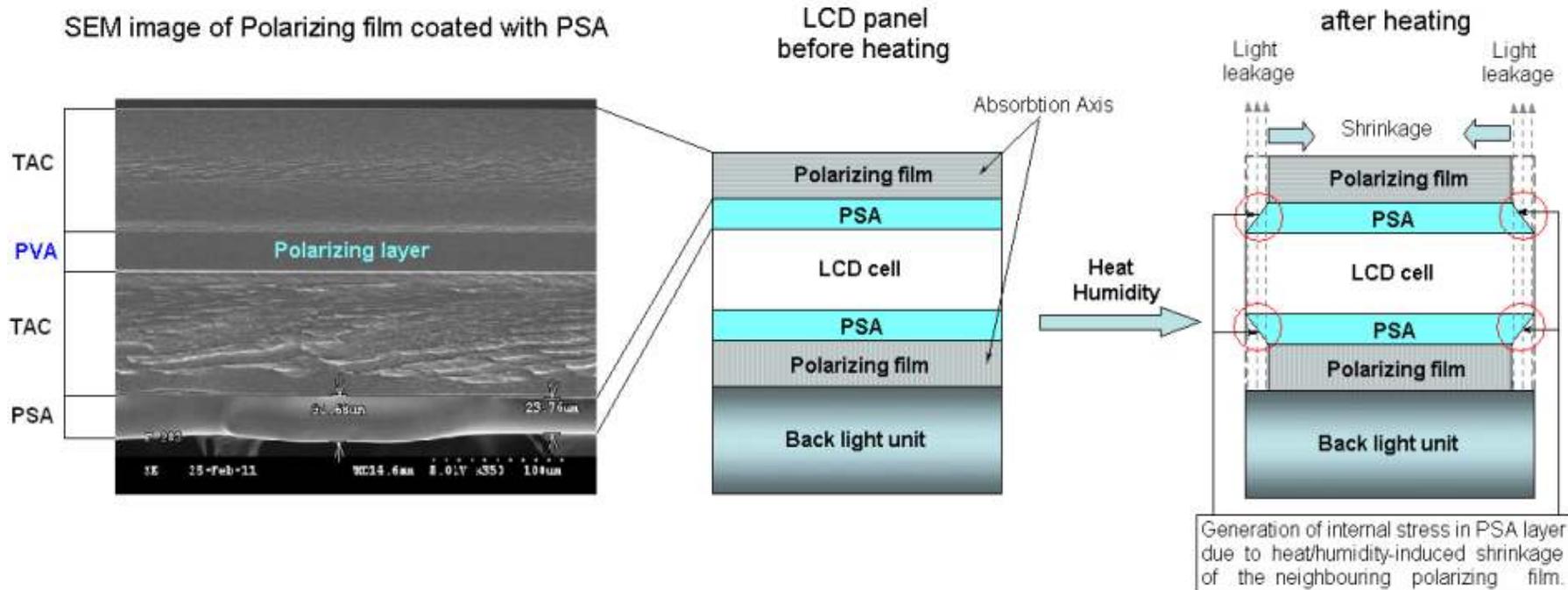
Stretched PVA film tends to shrink back at high temperature and high humidity conditions



Disorientation of polarizer



Polarizer and PSA

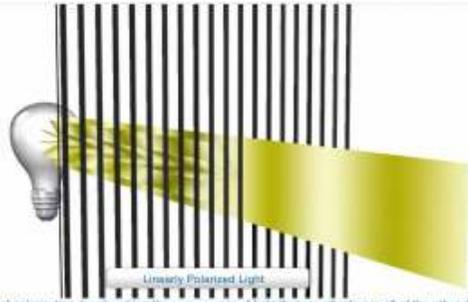


Pressure-sensitive adhesive (PSA) is used for assembling the polarizing films onto an LCD panel. PSA should possess a balanced adhesive/cohesive strength. The classification of PSAs by modulus can be done as following:

1. Soft type (low Tg binder, low content of a hardener)
2. Hard type (low Tg binder, high content of a hardener)
3. Semi-soft, semi-hard (high Tg binder, low content of a hardener).



Role of PSAs for Polarizer

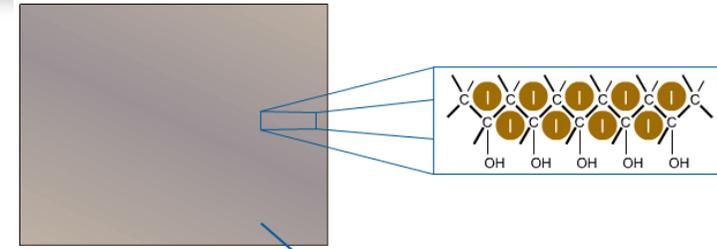


Unpolarized Light
on plane of polarization, by absorbing the components of light that are vibrates in all of the other directions.

Polarizer in TFT-LCD



If one on the polarizing film removed, we will stare at the white light screen



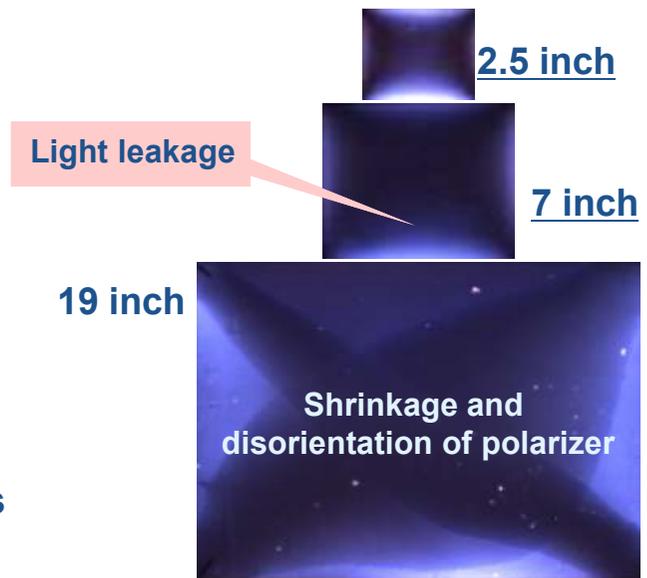
Polyvinyl Alcohol Film (PVA)

Main part of polarizer PVA: stretched & doped with iodine

High temperature
High humidity

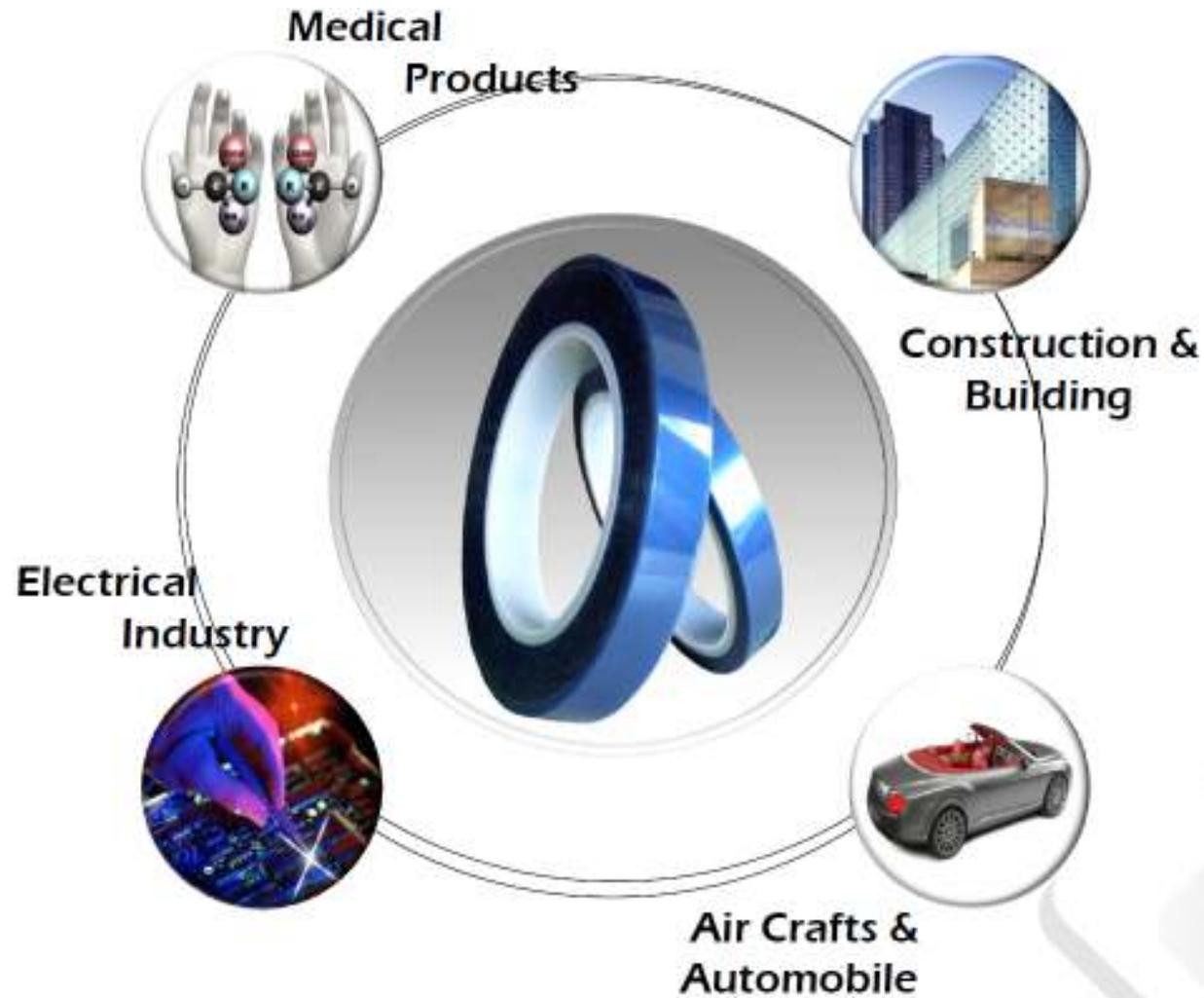


★ Reinforced multi-functional PSA can help
← Universal application for a variety of products



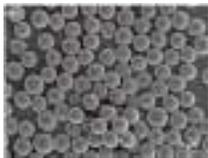


Other applications of PSAs



New trends in adhesives

Spherical PMMA microbeads



Average size
4.54 μm



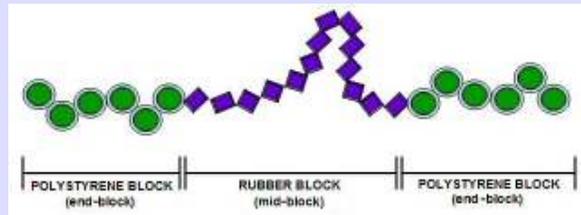
There are very unique conditions in space.

- Temperature range -200 ~ 200°F;
- Vacuum environment;
- High radiation.

- Bonding solar cells to their support structure;
- Bonding cover glass to solar cells;

- Encapsulation of electronic components for protection and insulation

Hotmelt = Triblock + Diblock



- end-blocks and mid-blocks are completely incompatible polymers;
- arrange themselves into *domains* on a microscopic level;
- reduction of “back scattered” light and improve resolution of images.

Adhesive Type	Operating Temperature °F (°C)
Silicone	-100 to 500 (-73 to 260)
Acrylic	-20 to 350 (-29 to 177)
Rubber	0 to 350 (-18 to 177)

General requirements for any material used in space:

- Good resistance against radiation degradation;
- Outstanding atomic oxygen resistance;
- Excellent micro-cracking resistance against thermal cycling;
- Low outgassing characteristics.

High requirements to products' quality





Thank you!

