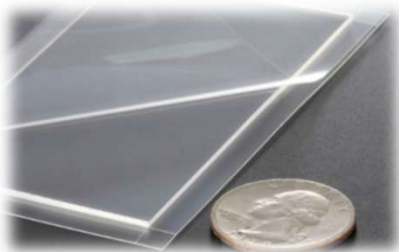


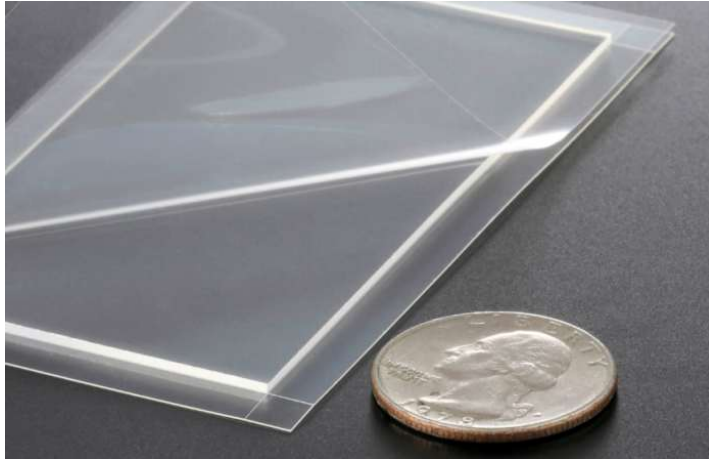
# Free Crystal®

## Features of super thick OCA



Advanced Elastomer Products Division  
BANDO CHEMICAL INDUSTRIES, LTD.

# Features of NT series



## Structure

**Light liner**

**Polyurethane-based OCA  
(500~1,500 $\mu$ m)**

**Heavy liner**

(Thickness line-up)  
500 $\mu$ , 800 $\mu$ , 1000 $\mu$ , 1500 $\mu$

**Thickness** : Wide range of thickness 500~1500 $\mu$ m

**Unique design** : Both achieving high adhesion and softness

**High reliability** : No bubbles, no delamination, no color change even after environmental tests of automotive use  
No bubbles, no delamination even after altitude tests of avionics use

# Unique design



Achieving both high adhesion and softness

| OCA type            |              | Adhesion | Softness |
|---------------------|--------------|----------|----------|
| Competitors' OCA    | Acrylic OCA  | High     | Hard     |
|                     | Silicone OCA | Low      | Soft     |
| <b>Free Crystal</b> | NT series    | High     | Middle   |

# Relieving stress on LCD



Relieving stress on LCD is expected by softness and thickness of OCA. It helps to **avoid LCD Mura**.

※Degree of display-mura depends on display device and/or cover material.

Bonding with competitor's OCA



Bonding with NT series



# Excellent optical reliability : Anti-whitening

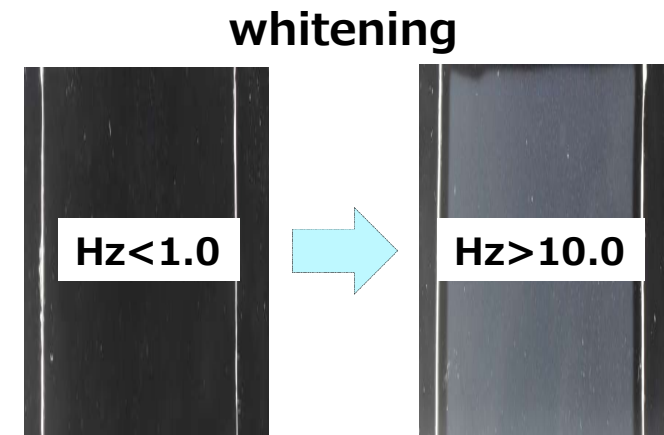


NT series\_RA test results (t=1000μm)

| Condition | Time  | Haze (%) |
|-----------|-------|----------|
| Initial   | —     | 0.39     |
| 85°C/85%  | 1000h | 0.30     |
| 95°C/dry  | 1000h | 0.35     |
| UV_60W/m2 | 1000h | 0.42     |

- Haze is measured on Glass/OCA/Glass structure

No whitening



Example of competitor's  
silicone OCA evaluation  
(whitening on 85°C/85%)

# Excellent optical reliability : Anti-yellowing

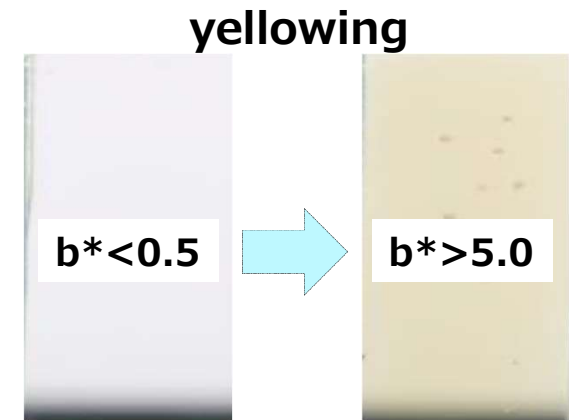


NT series\_RA test results (t=1000μm)

| Condition | Time  | b*   |
|-----------|-------|------|
| Initial   | —     | 0.26 |
| 85°C/85%  | 1000h | 0.32 |
| 95°C/dry  | 1000h | 0.39 |
| UV_60W/m2 | 1000h | 0.44 |

- b\* is measured on Glass/OCA/Glass structure
- b\* of Glass/Glass is 0.23

No Yellowing



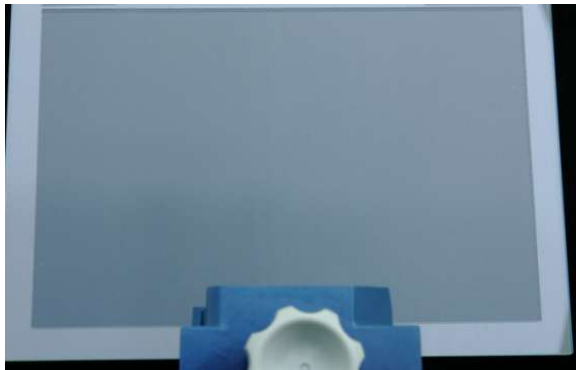
Example of competitor's acrylic OCA evaluation (yellowing & bubbles on UV)

# Excellent adhesion reliability : Altitude test

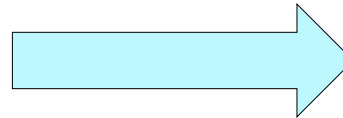


In avionics use, it is required that no bubbles occur after altitude test.  
NT series has no bubbles even after 55,000ft altitude test.

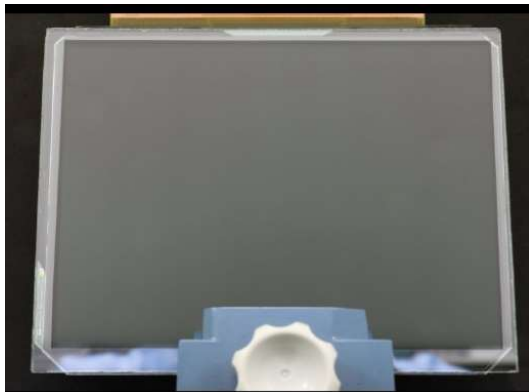
Competitor's  
OCA



Decompression  
(35,000ft Altitude)



NT series



Decompression  
(55,000ft Altitude)



# Available applications



Bonding of flat LCM  
with metal bezel

Cover (glass/plastic)



OCA



- Fill the gap of LCM bezel height.

Flat LCD cell bonding

Cover (glass/plastic)



OCA



Open-cell LCD

- Absorb the warpage of large size cover material
- Relieve the stress from expansion& shrinkage of cover plastic

Curved bonding

  
Curved cover (glass/plastic)



OCA



Open-cell LCD

- Avoid the delamination from the force of LCD cell to be flat

# Contact Window



Sales & Marketing Dept.  
Advanced Elastomer Products Div.  
BANDO CHEMICAL INDUSTRIES, LTD.

Please fill out the inquiry form from the following URL.

[https://marketing.bandogrp.com/EN-E-TS-2001-E-EN\\_inquiry.html](https://marketing.bandogrp.com/EN-E-TS-2001-E-EN_inquiry.html)

