

Developed technology

YU-FIC

# Improved Mechanical Strength of Flexible OLEDs on Ultra-thin Glass

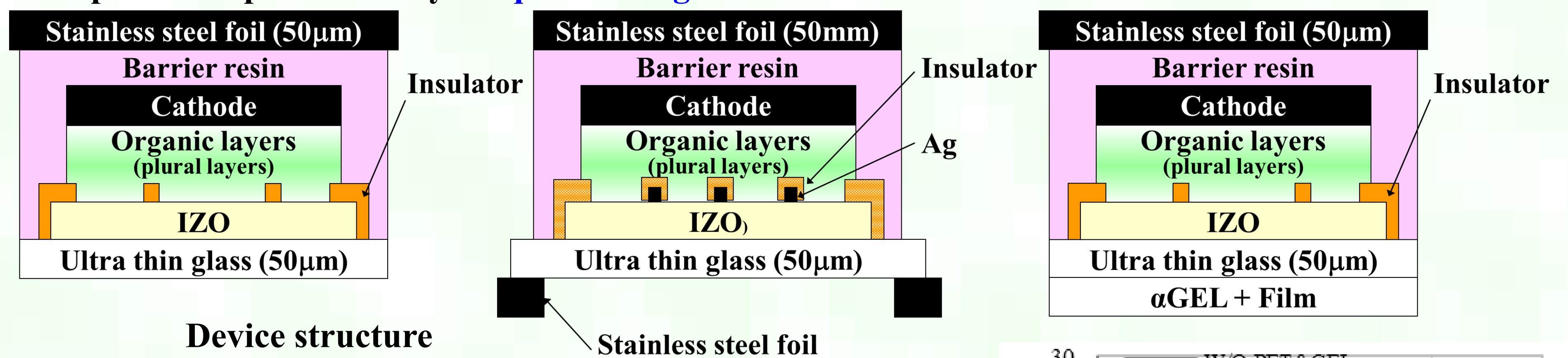
We develop technologies for **improvement of mechanical strength** of flexible OLED devices fabricated on ultra-thin glass.

## Technological features

- Improved mechanical strength of flexible OLED devices **ultra-thin glass** with the thickness of 50 $\mu$ m.

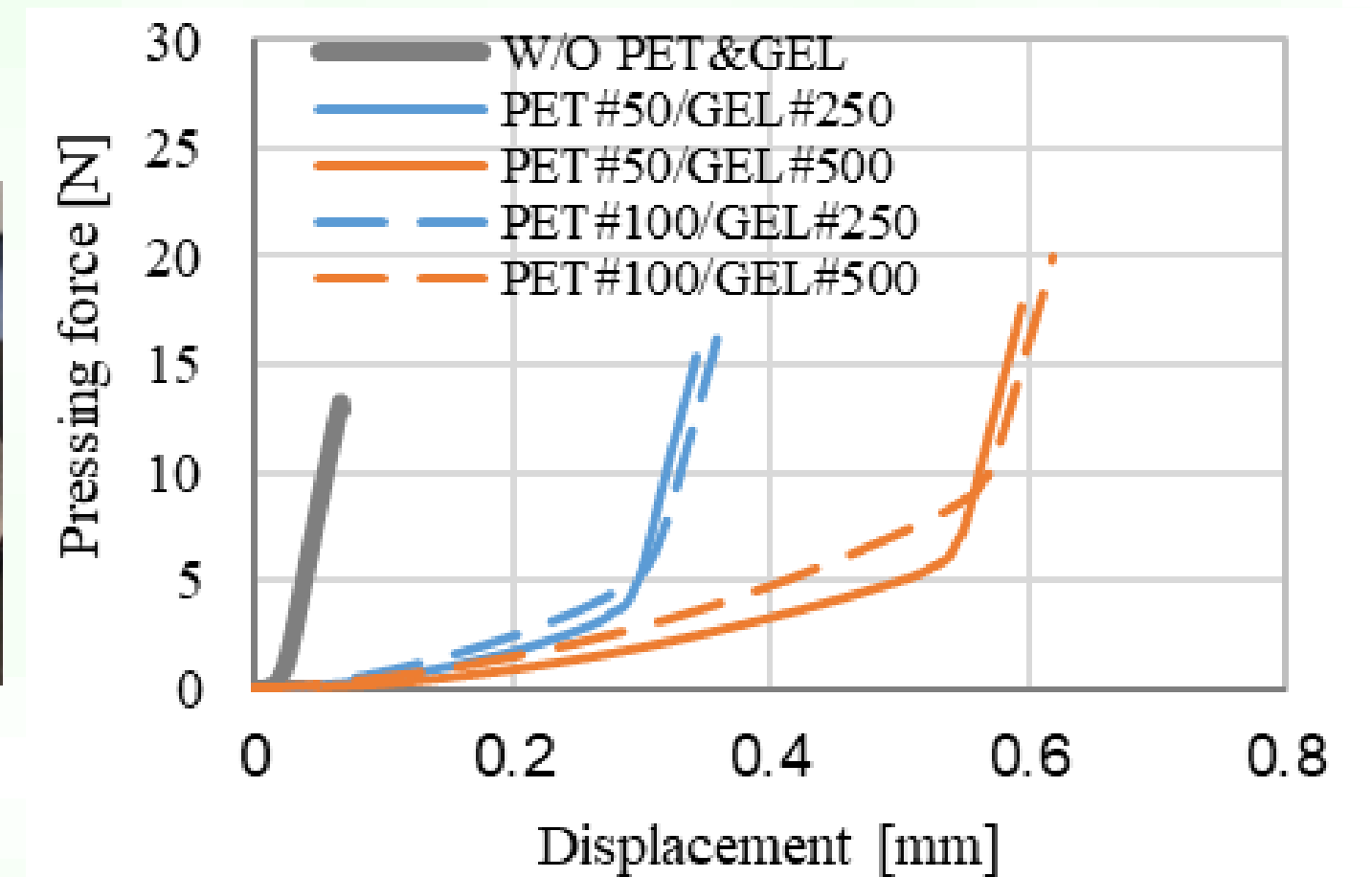
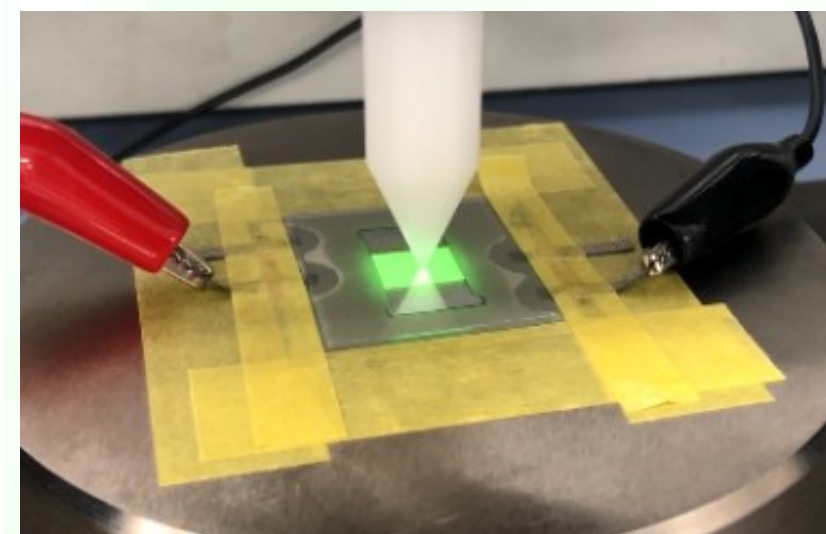
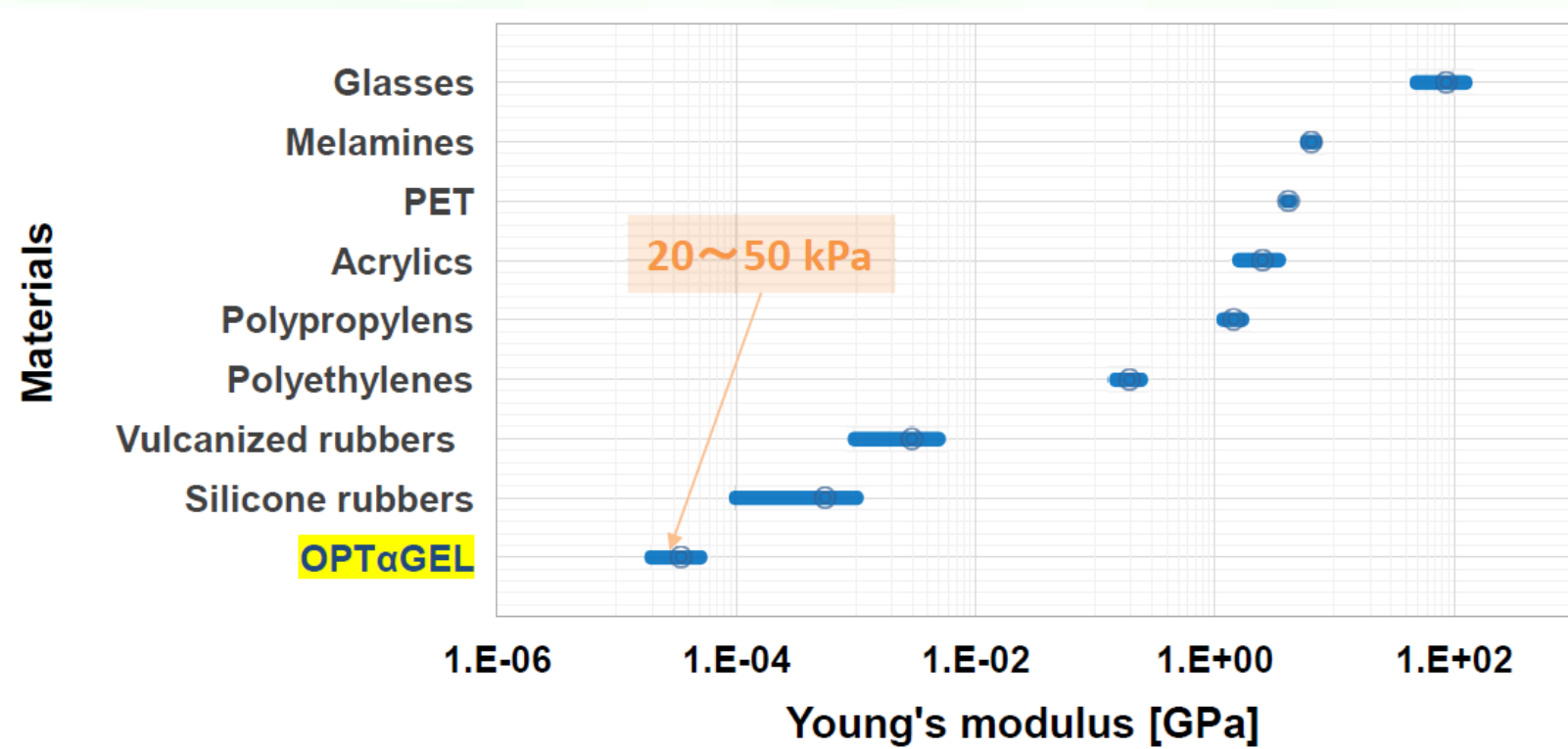
## Developed technologies

- Improved mechanical strength by encapsulation with **stainless steel foil**.
- Reduced side edge crack under **glass cutting**.
- Improved impact stress by **unique silicon gel**.



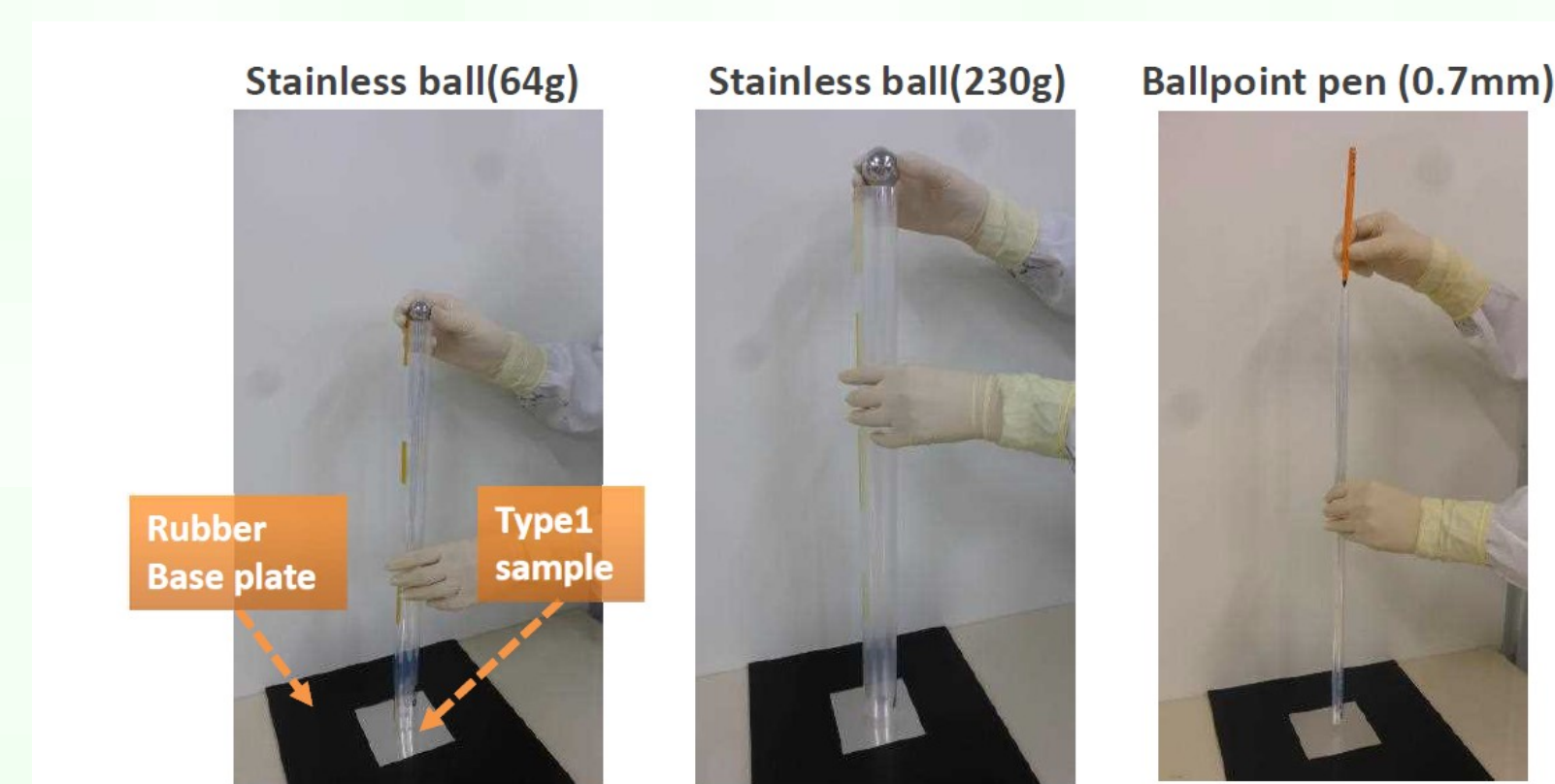
Device structure

Stainless steel foil



Young's modulus of various materials

Pressure stress test ( $\alpha$ GEL)



Cover film / Thickness [ $\mu$ m]	Protection layer			Height when glass cracked [cm]	
	OPT $\alpha$ GEL t250 $\mu$ m Needle penetration [1/10mm]	Stainless ball drop 64 [g]	Stainless ball drop 230 [g]	Ballpoint pen drop	Ballpoint pen drop
-	-	60~80	20~40	10	
PET / 100	-	90~100	60~80	20~50	
PC / 200	-	50~60	> 100	50~70	
PET / 100	130	> 100	70	50~60	
PC / 200	130	> 100	90	50~70	
PC / 200	90	> 100	> 100	80	
PC / 200	50	> 100	100	50~60	
PC / 200	25	> 100	80~90	60	

Drop Impact test ( $\alpha$ GEL)

## Collaboration

Nippon Electric Glass Co., Ltd., Mitsubishi Diamond Industrial Co., Ltd., NIPPON STEEL Chemical & Material Co., Ltd., Taica Corporation, tesa tape K.K.

## Related program

- Yamagata University Flexible Electronics Japan-Germany International Collaborative Practical Utilization Consortium (YU-FIC) [Oct. 2017~Mar. 2023].
- JST: OPERA Program Grant Number JPMOP1614 [FY2016~FY2020].
- MEXT: Construction Program of Open Innovation Organization [FY2018~FY2022].

## Publication

- T. Furukawa, J. Hauptmann, T. Nakagaki, R. Ikeuchi, M. Sagawa, D. Nagata, J. Nakatsuka, IDW'21, FLX5/FMC6-1 (2021). "Roll-to-Roll Fabrication for OLED Lighting Using Ultra-Thin Glass Substrate and Encapsulating Stainless Steel Foil"
- M. Natsuka, Y. Ono, H. Mataka, S. Usui, H. Suzuki, M. Abe, T. Furukawa, IDW'21, FLX5/FMC6-2 (2021). "Protection of OLED Lighting with Ultra-Thin Glass by Special Silicone Gel"