

# Visit Report

To : CHAA  
Cc : CAAG, FNM, WNGJ, GUOS, LIAW, MYR  
LAIC, GUOC, ZHAI, LINR, XUEA, FUJT  
From : HAJU

Date of visit: 27 June. 2023  
Date of report: 04 July. 2023

## Google

Participants : Google : Mr.Chris Hung (*Plastic & Elastomer*)  
EMS : J. Ha. A.Chang  
OEM : Garmin  
Sales responsible : CHAA  
Distributor : N/A  
Location : Taiwan  
Application : Protect housing of Mobile phone  
Segment Code : 840  
Project number : 840-230330-1  
Material : BTR 600 LS  
USP : Bio material & Chemical resistance & UV resistance  
Potential : 30 t/a  
SOP : 2Q.2024



### 1. Target of visit

Check a project status for material testing and development plan.

### 2. Summary

- BTR 600 met deformation issue at hot press and BTR 400 lead time will be checked again
- "PC+LSR" protecting housing for previous model got complaints in the market on yellowish and deformation, which won't be adopted in future model
- Tritan (PCR) is one of the key competitor for BTR for this application

### 3. Details

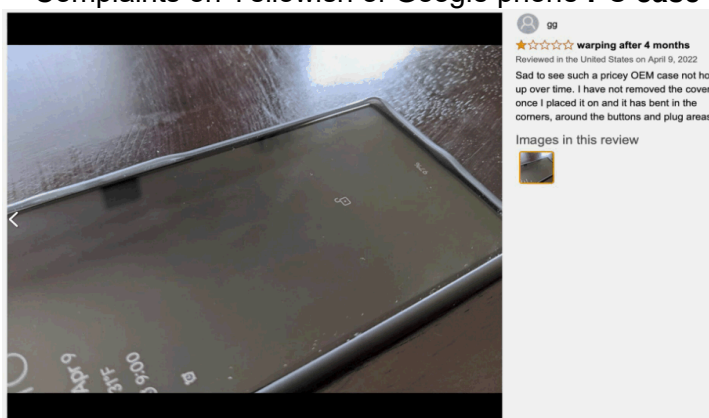
#### Customer & Project information

- BTR600 (Tg=118C) was tested for Pixel foldable phone case, but chemical test did not proceed due to a deformation issue at hot press 120°C for bonding with soft non-woven fabric that Google says a micro fiber.
- BTR 400 (Tg=160C) is more suitable but BTR600 was delivered for Google's testing due to no stock issue.
- How to bond a magnet to phone case is not determine, but it might be a hot melt according to Google R&D.

- As another mentioned requirement, Required UV resistance from CMF of Google is too high, it will be adjusted but it is expected to require high UV resistance. If hot melt and high UV resistance required, BTR400(UVH) could be better choice due to low heat resistance of BTR600. \*Not share details on UV requirement.
- Google got complaints (yellowish, deform) of phone case about official Google Pixel case made of PC(PCR). (Details as attachment #1)



< Complaints on Yellowish of Google phone PC case >



< Complaints on Deformation of Google phone PC case >

- Google foldable phone(Pixel fold) which was released for the first time this year has a transparent case made of PCTG (PCR), made by 3<sup>rd</sup> party (CASE-MATE)  
\*On sale in Google web site

### Part & Test Requirement

- Drop test : 1.5m with 6 directions.
- Tumbling test x 6 cycles (1cycle = 24 hrs) with Chemical(DEET, Sunscreen, Ketone) resistance \*Test after applying chemicals to case
- Hot temp 60-80°C, 6 cycles (1cycle = 24 hrs)
- Bio or recycled material

### 4. Actions

No.	Action	Resp.	Due date
1	Prepare BTR400(UVH) & BTR600 for testing of Google	Alex	Aug.30 <sup>th</sup>
2	Check clear requirement and processing	HAJU	Aug.30 <sup>th</sup>

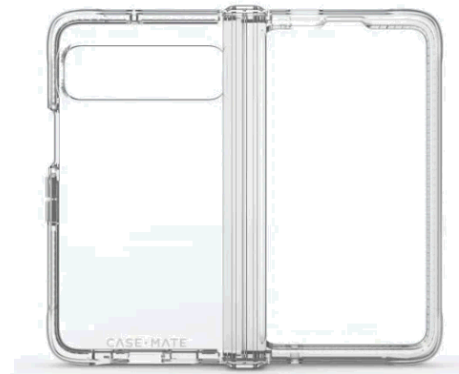
### 5. Attachments

- #1 Google foldable phone case
- #2 BTR properties comparison

Best regards,  
Jun Ha

## #1 Google foldable phone(Pixel fold) case

Case-Mate Tough Clear Plus for Pixel Fold\*



## #2 BTR properties comparison

	Unit	Grilamid TR 90	Grilamid TR 90 LXS	Grilamid BTR 400	Grilamid BTR 600 LS	Grilamid BTR 650 LS	Grilamid BTR 700 LS	Grilamid BTR 800 LS
E-modulus	GPa	1.6	1.5	1.75	1.7	1.7	1.65	1.55
strength at break	MPa	45	40	60	55	55	55	50
Elongation at break	%	>50	>50	>50	>50	>50	>50	>50
strength at yield	MPa	60	60	50	65	65	65	60
Elongation at yield	%	6	6	6	7	6	6	5.5
Notched impact Charpy 23°C/-30°C	kJ/m <sup>2</sup>	13 12	9 12	10 9	10 10	8 10	8 12	8 13
Density	kJ/m <sup>2</sup>	1.00	1.00	1.04	1.02	1.05	1.05	1.05
Bio-contents*	%	-	-	39	60	65	70	80
Tg	°C	155	125	160	118	100	90	70
Light transmission/2mm	560nm			93		92	92	92
Tranparency @ 3mm	%	91	91		91			
Refractive Index		1.511	1.511	1.511				
HDT/A @ 1.8MPa	°C	115	80		90			
HDT/B @ 0.45MPa	°C	135	100	140	105	92	82	68