

Reactive Hot Melt Adhesive for Fine Dispensing

Koji Suzumura Kazuyuki Magome Soichiro Komiya Chika Kuramochi

Polymer Materials R&D Dept.,
Advanced Performance Materials R&D Division,
Advanced Performance Materials Business Headquarters

1 Abstract

In recent years, narrow-bezel display is applied for various smart phones. But it is difficult to apply double-side stick tape because adhesion strength and punching accuracy are insufficient at this application. Therefore new process which use liquid-type adhesive has been investigating at device manufactures. HC has newly developed reactive-hot-melt adhesive Hi-PURSHOT 8958 and 4777 available for narrow-bezel structure. These materials shows shorter cure time, fine dispense ability and good adhesion properties to various substrates such as metals, glass, and plastics. Hi-PURSHOT 4777 also has a light-shading ability and it is effective to avoid the leakage of light wave.

2 Characteristics of the product

- Non-solvent, one-component moisture curable hot melt adhesive
- Fine-line gluing by dispenser is possible (< 0.4mm)
- Able to provide waterproofing ability (comparable to IPX-7rating)

3 Background of the development

Hitachi Chemical group developed reactive hot melt adhesive products, the Hi-Bon series, using its own polyester resin synthesis and urethane modification technologies, and sells them for use in various applications such as construction material, bookbinding, fiber and automobiles¹⁾. Subsequently, we made multiple improvements in the adhesive properties to expand the use of our products into the electronics equipment market, and introduced Hi-PURSHOT, a reactive hot melt adhesive for fine-line dispensing, to the market in 2010. This product has already been selected by many companies for waterproof digital cameras and waterproof smart phones because of its fine-line dispensing and waterproofing capabilities. Application to a narrow-bezel structure, however, required us to provide better adhesion to various frame body materials, falling impact resistance and light-shading effect. So, we re-examined the material design to use a polyol component as a main raw material and successfully developed Hi-PURSHOT 8958 and 4777, applicable to a narrow bezel structure.



Figure 1 Appearance of Hi-PURSHOT



Figure 2 Appearance of dispensed sample

4 Details of the technology

1) Characteristics of Hi-PURSHOT 8958, 4777

Product characteristics and characteristics of the cured layer are shown in **Table 1**. Hi-PURSHOT 8958 and 4777 have higher shear strength of cured layer adhered on various substrate materials. These products are also designed so as to provide higher elongation and strength of cured layer to enhance falling impact resistance. Again, Hi-PURSHOT 4777 has a high visible light shading capability with light transmittance equal to or less than 0.01% measured at 100 μm thickness.

Table 1 General properties of Hi-PURSHOT

Product name		Unit	8944	9753	8958	4777
Applied substrate		—	For plastic substrate	For metal/glass substrate	For metal/glass/plastic substrate	For metal/glass/plastic substrate
External appearance		—	White/Half-transparent	White/Half-transparent	White/Half-transparent	Black/Light-shading
Viscosity (110°C)		Pa · s	5	7	6	8
Open time min.		min	2	4	2	2
Characteristics of cured layer	Tensile strength	MPa	30	5	12	11
	Elongation at break	%	690	1300	1300	1200
	Young's modulus	MPa	60	25	40	20
	Visible light transmittance* ¹⁾	%	—	—	—	< 0.01
	Waterproof ability	—	Comparable to IPX7	Comparable to IPX7	Comparable to IPX7	Comparable to IPX7
Shear bond strength* ²⁾	Polycarbonate resin	MPa	4.4	3.8	4.4	4.0
	Acrylic resin		3.1	1.9	3.4	2.6
	Stainless steel		1.2	2.8	2.6	2.6
	Aluminum		1.0	3.5	3.6	3.7
	Glass		1.7	3.2	3.2	2.7

*¹⁾ Averaged visible light transmittance measured at 100 μm thickness *²⁾ Adhesive layer thickness: 50-70 μm, Pulling speed: 10 mm/min

2) Ability to moisture cure

The relationship between time to moisture cure and shear bond strength is shown in **Figure 3**.

Development products show faster curing than conventional ones, for example, 2 hours for Hi-PURSHOT 8958 and 4 hours for Hi-PURSHOT 4777 are adequate to generate enough shear bonding strength.

As a result, lead time at clients can be reduced substantially.

3) Waterproof ability

Results of waterproofing test are shown in **Table 2**, and external appearances after testing are shown in **Figure 4**.

No water penetration was observed after hot-melt-dispensed and pressure-bonded test pieces with dispensed line width of 0.5 mm and bonded layer thickness of 0.1 mm were placed 1 m under water for 30 min.; it showed excellent water proofing ability.

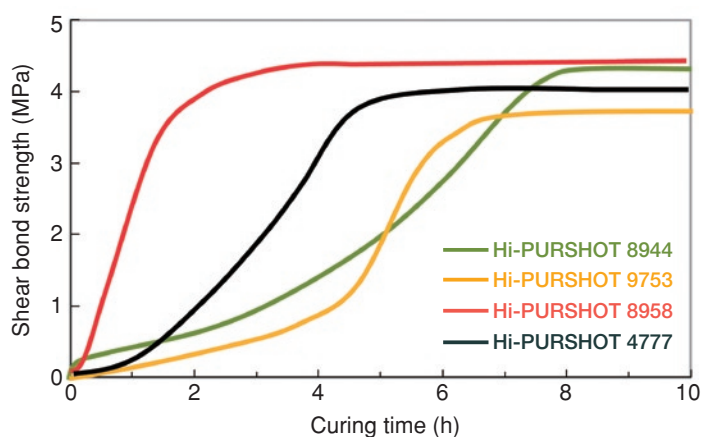


Figure 3 Behavior of shear bond strength

Table 2 Water-proof ability

Product name	8958	4777
Waterproof ability (comparable to IPX-7)	No water penetration	No water penetration

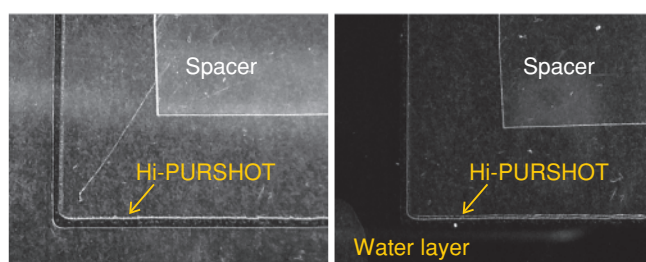
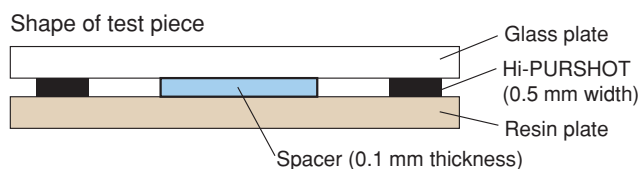


Figure 4 Appearance after water-proof test (Hi-PURSHOT 4777)

5 Future Business Development

- Development of material with increased bond strength and higher falling impact resistance while pursuing our goal toward even more fine line dispensing

[Reference]

- 1) Tatsuya Amano, Journal of The Adhesion Society of Japan, 40(6), p.265-26 (2004)