

Correlation between Flash and Mechanical Properties of POM

Research center

1. Outline

Plastic products can be broken due to weld lines, voids, sharp corners, flash and so on. This study contains various test results to understand how flash creates cracks on plastic products. It aims to explain why the avoidance of flash in areas where stress is concentrated is necessary.

2. Correlation between Flash and Mechanical Properties of POM

(1) The flash-crack mechanism

- 1) Flash in the area where stress is concentrated can cause cracking.
- 2) The crack serves as a notch.
- 3) Brittle fracture begins from the notch.

(2) Test outline

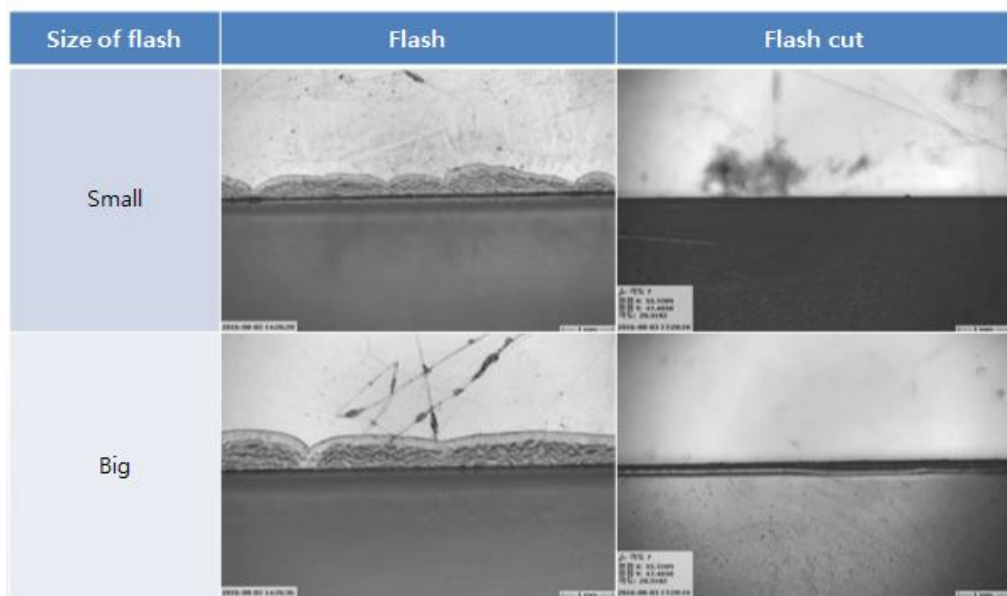
- 1) Grade : KEPITAL F20-03
- 2) Test properties : Tensile properties, impact strength, weld properties
- 3) Tested specimen

- ① A specimen without flash
- ② A specimen with flash
- ③ A specimen with flash removed from the ② specimen

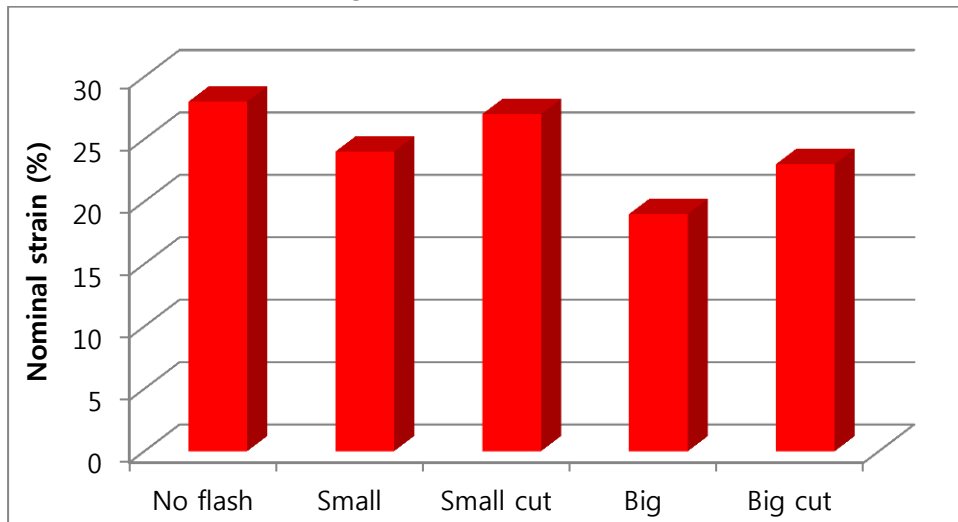
(3) Test results

1) Tensile properties

- ① Flash on the specimens



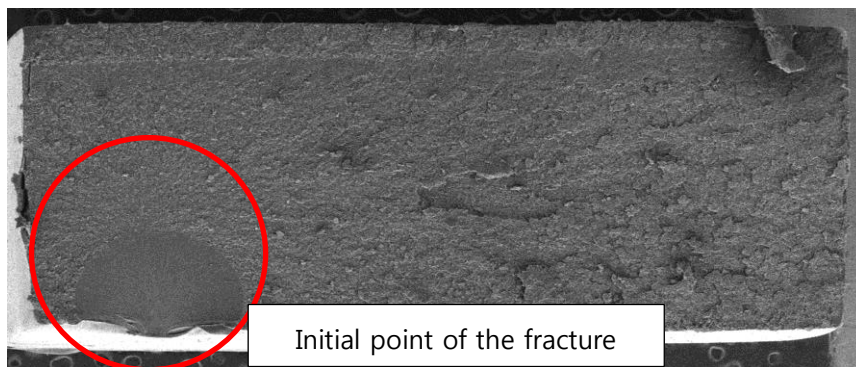
② Nominal strain according to the size of flash



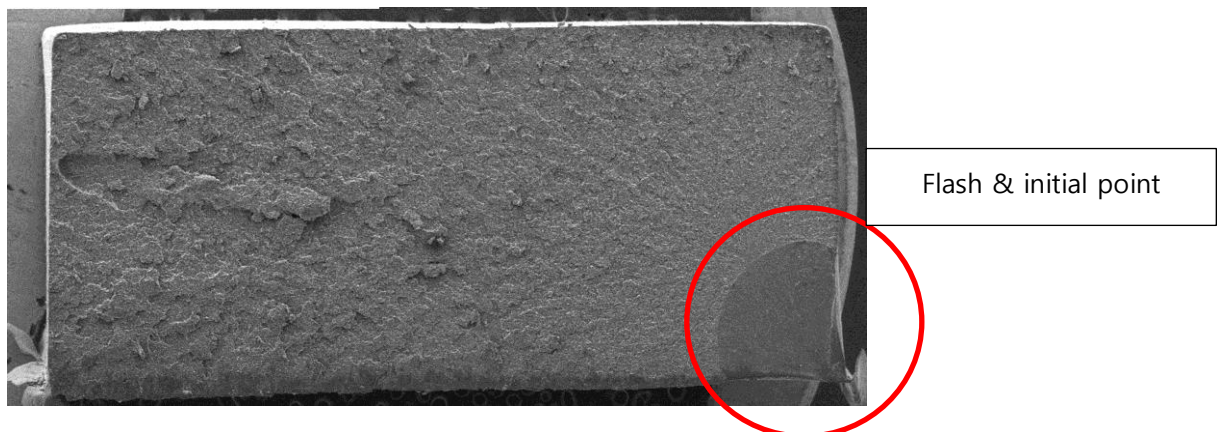
- ⇒ There is a tendency for nominal strain to decrease as flash size increases.
- ⇒ When flash is removed (small cut, big cut), the nominal strain is restored to a similar level to that of the no flash (control).
- ⇒ All specimens have the same level of tensile strength since they are broken in the area beyond the yield point.

③ SEM analysis

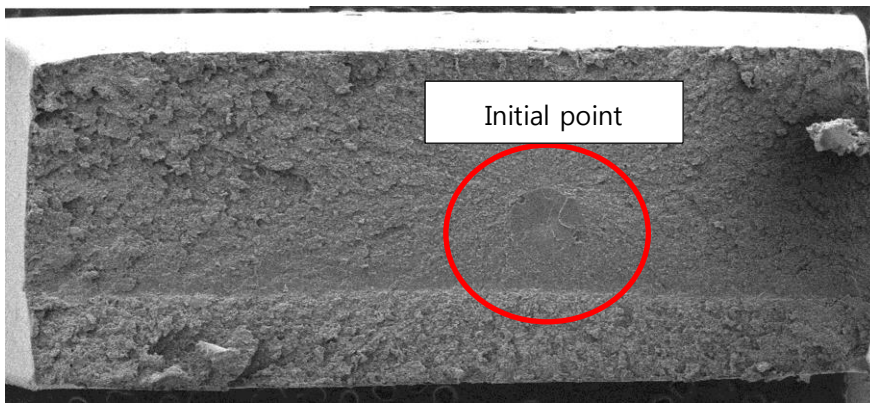
① No flash(control)



② Flash



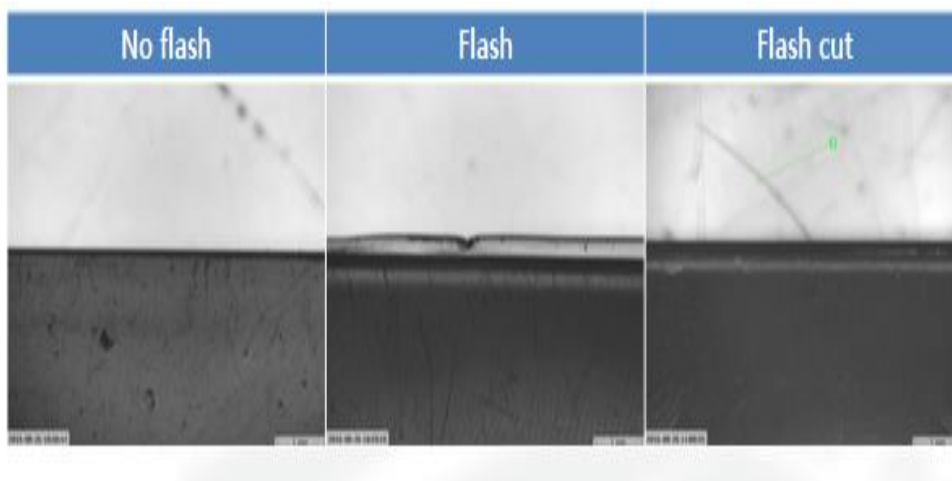
© Removed flash



- ⇒ If there is flash on a product, a crack originates from it.
- ⇒ In the cases of the no flash (control) and the removed flash, the fracture initial point appears unpredictably.
- ⇒ Flash accelerating the crack is observed.

2) Impact properties

① Flash on the specimens



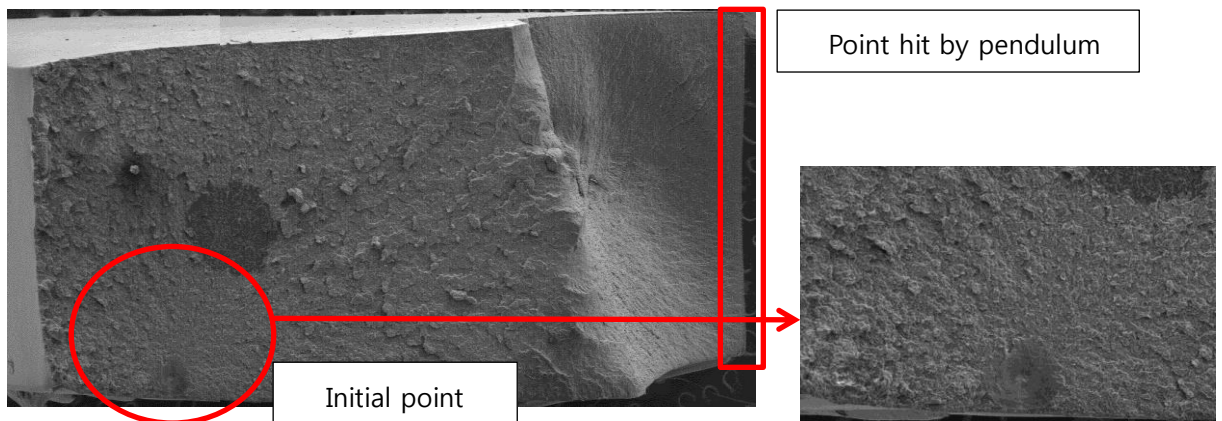
② Charpy impact strength without a notch

Specimen	Unit	The number of broken specimens (n=7)	Average impact strength of the broken specimens
No flash	KJ/m ²	1	212
Flash		7	202
Flash cut		1	291

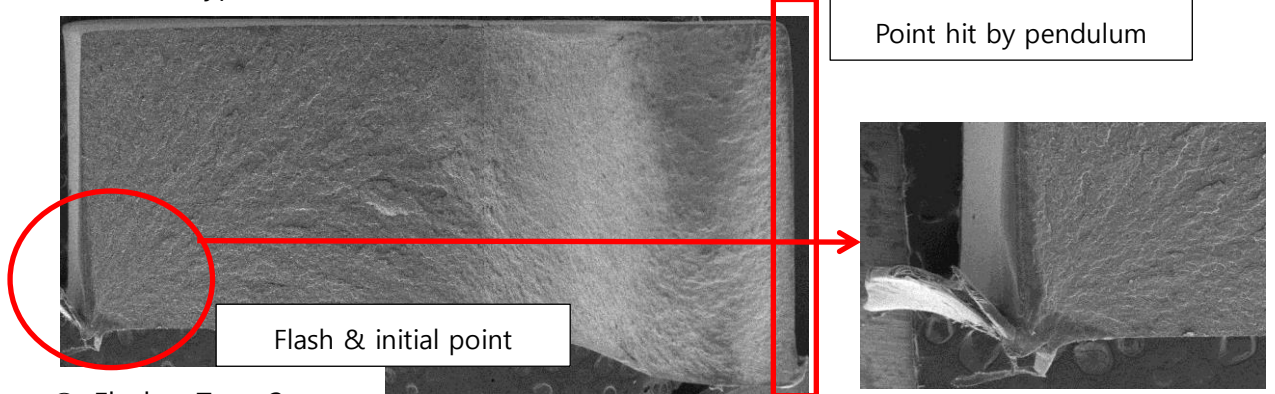
- ⇒ The specimens with flash have a large impact strength deviation according to the size and shape of flash. (Min. : 8 KJ/m², Max. : 328 KJ/m²)

③ SEM analysis

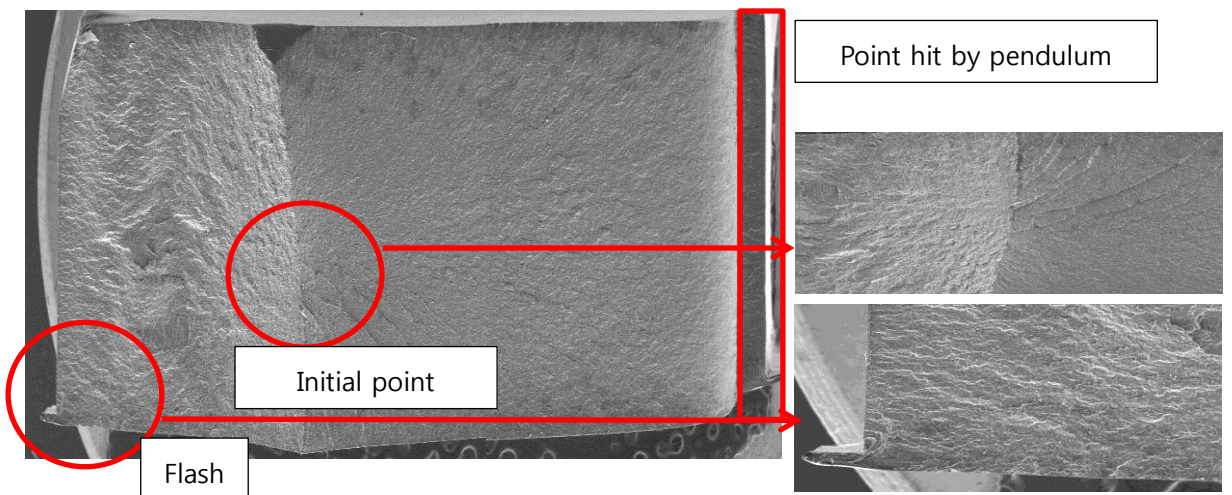
① No flash(control)



② Flash – Type 1



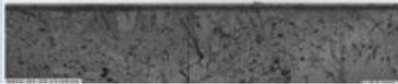



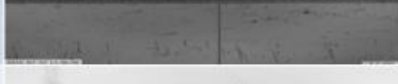
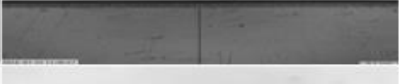


③ Flash – Type 2



- ⇒ In the case of the specimens with flash, two different initial positions are observed: one at the flash and the other at the center of the specimen.
- ⇒ The influence of flash on the crack varies according to the size and shape of flash.
- ⇒ The specimen with a crack initiated from flash has less impact strength.

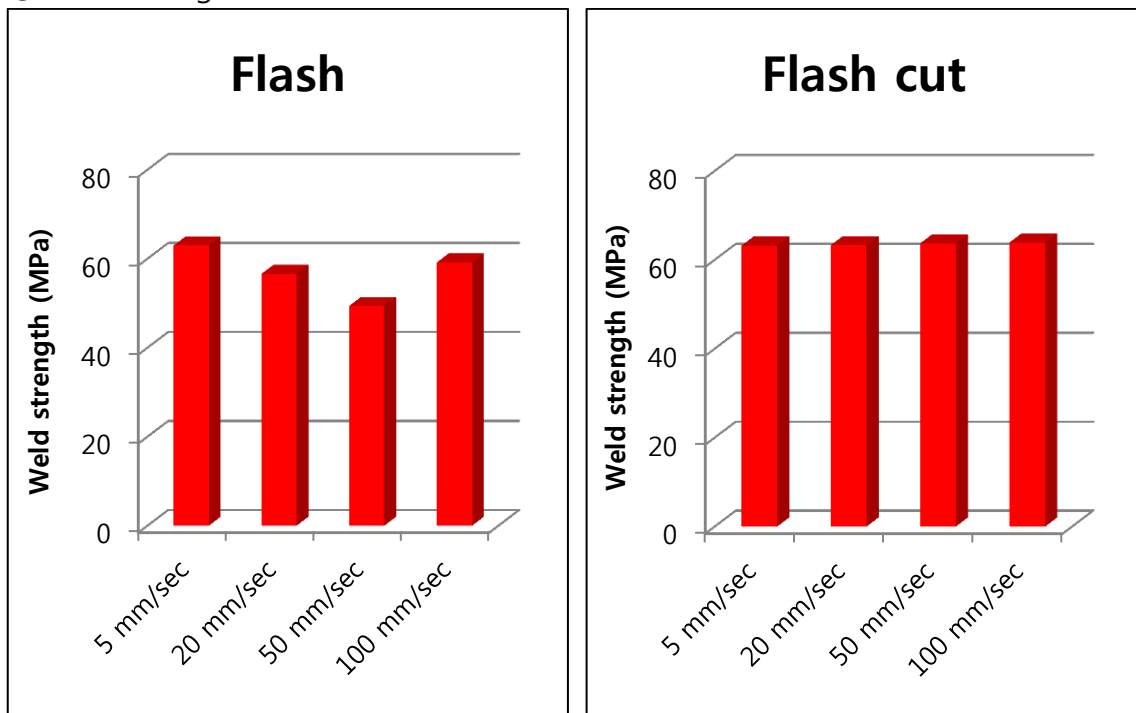
3) Weld properties

① The size of flash according to injection speed

Injection speed	Flash	Flash cut
5 mm/s		
20 mm/s		
50 mm/s		
100 mm/s		

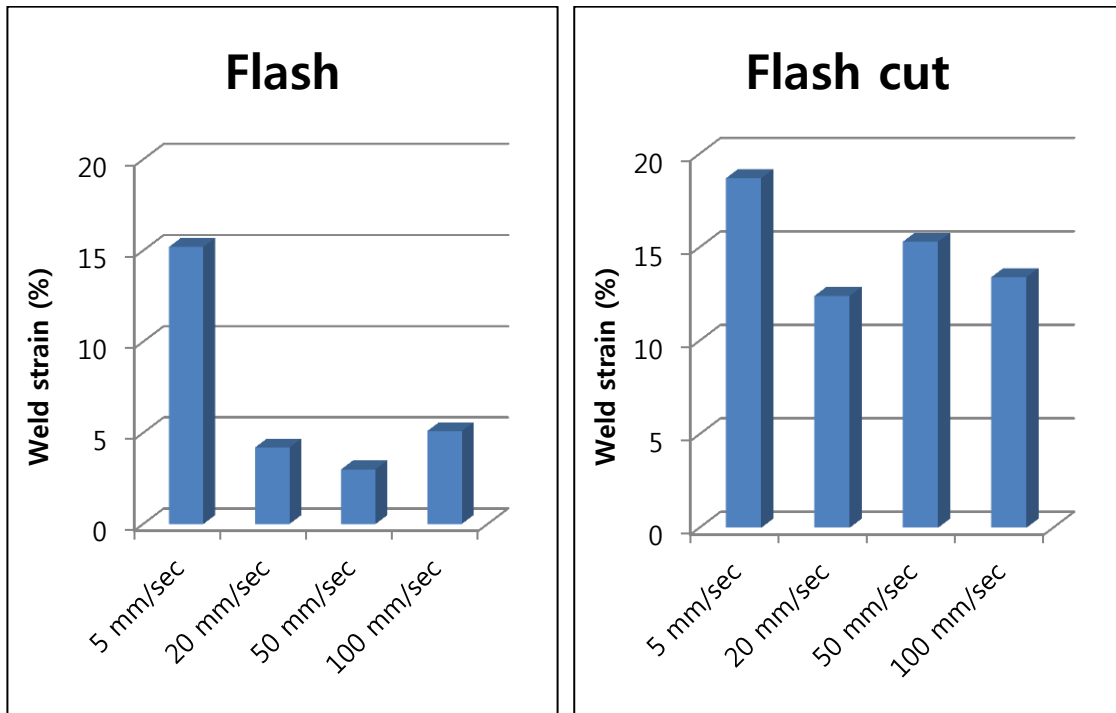
② Test results

a) Weld strength



- ⇒ There is a tendency for the weld strength to decline as the size of the flash increases.
- ⇒ Minor flash is observed at 5mm/sec of the injection speed, yet weld strength does not decline.
- ⇒ The size of the flash is the biggest when the injection speed is set as 100 mm/sec, yet the weld strength is relatively higher due to the round effect of the flash.
- ⇒ All specimens with flash removed have the same weld strength level.

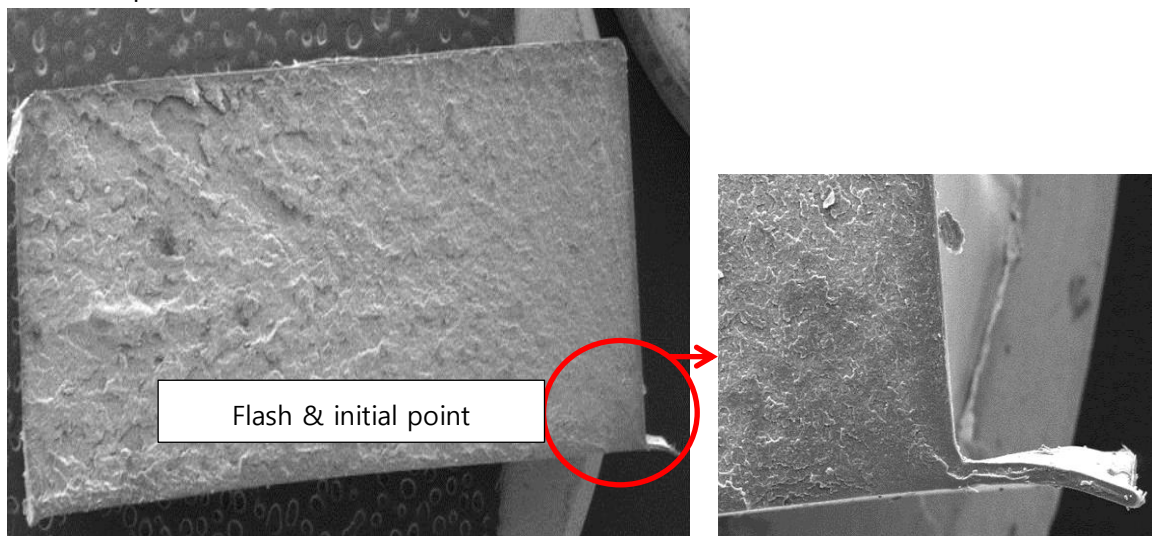
② Weld strain

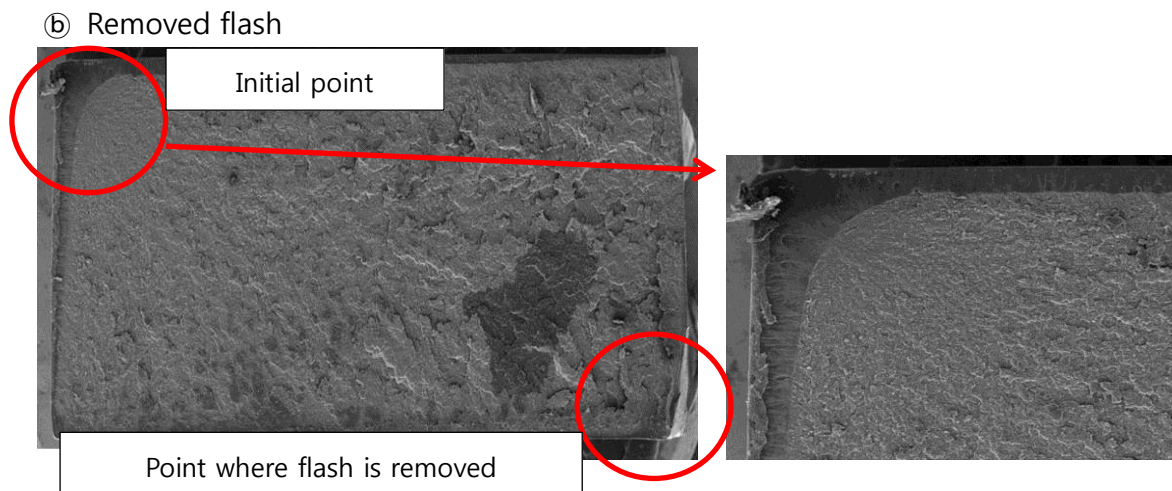


- ⇒ There is a tendency that the weld strain declines as the flash size increases.
- ⇒ The flash size is the biggest when the injection speed is set as 100 mm/sec, yet the weld strain of the specimens is relatively higher than that of others due to the round effect of flash, while it is much less than that of specimens injected at 5 mm/sec.
- ⇒ When the flash is removed, the weld strain increases.

③ SEM analysis

① Flash specimen





3. Conclusion

- (1) Tensile strain, impact strength and weld properties decrease due to flash on the specimen.
- (2) For all the specimens, every crack is initiated from the flash.
 - 1) In particular, impact specimens have two different initial points of the crack:
one at the flash, the other at the center of the specimen.
- (3) Removal of flash enables the specimens to regain similar properties to the no flash (control).
- (4) As such, flash occurring on a plastic product must be removed to prevent it from potential crack issues.

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