

# Polyamide Absorption Characteristics

Tech Center

### Moisture absorption of Polyamide

Polyamide absorbs moisture easily in comparison to most thermoplastics. Moisture can cause bubbles, silver streaks, and material aging on the product if the polyamide molds with it. Thus, sufficient pre-dehumidification and drying is required.

In addition, properties and size may change after molding. Water absorption occurs because of the chemical structure of polyamide. Water passes through amorphous parts between the amide syntheses and enlarges the distance between molecules.

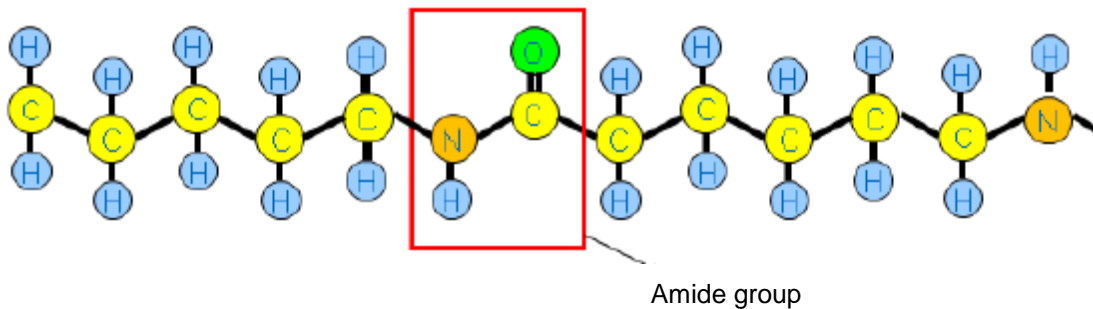


Fig.1 Chemical structure of polyamide

### Influence of moisture absorption upon polyamide's properties

Polyamide properties vary depending on moisture absorption as the material naturally absorbs water. When the polyamide absorbs more moisture, tensile strength, tensile modulus, flexural modulus, and hardness decrease conversely, elongation and impact strength increase. Thus, the product has to be designed with safety factors in mind depending on property changes per moisture absorption.

### Moisture absorption comparison by materials

Fig. 2 shows the absorption difference comparison between polyamide and PBT over 100 days. It shows that PA6 and PA66 have a greater absorption ratio than PBT. The different absorption rate between PA6 and PA66 is because of more amide synthesis in PA6.

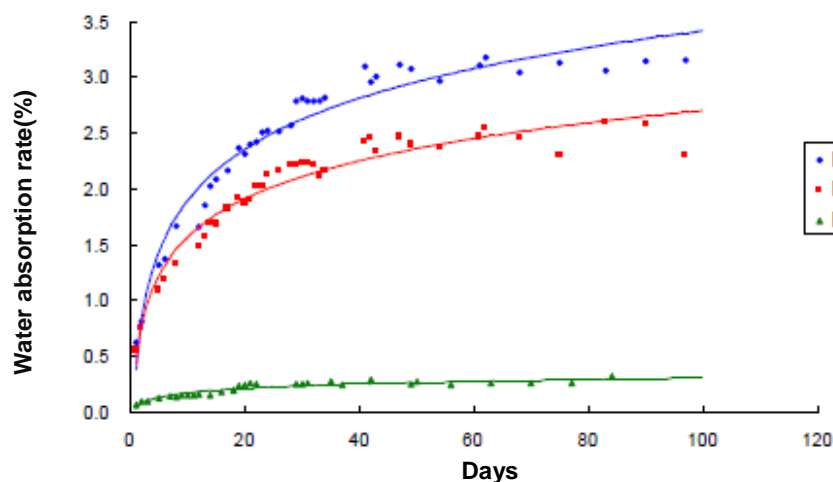
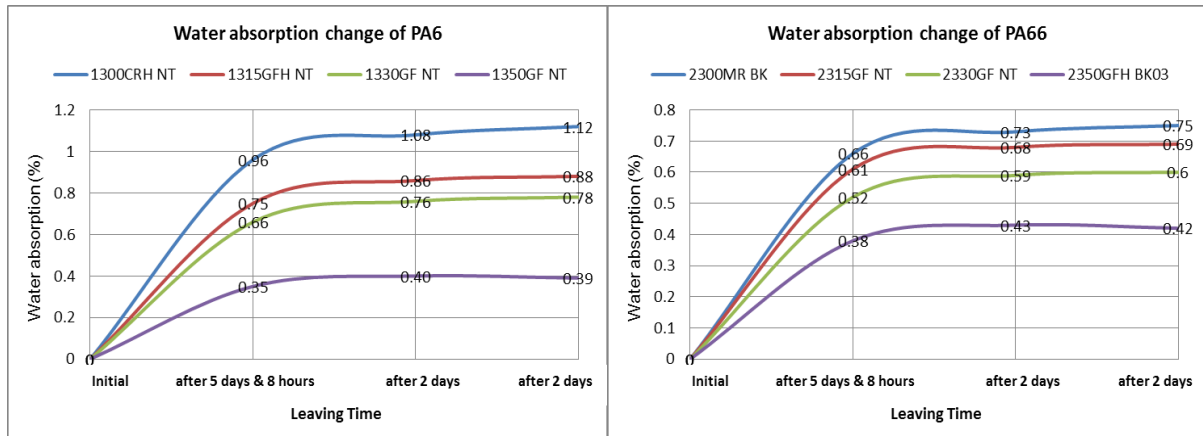


Fig. 2 Water absorption rate between PA6, PA66, and PBT by time

Note) 1. Absorption condition: 23 °C, 50% R.H.

## Water absorption ration change between main grades of PA6 and PA66

Fig. 3 explains the water absorption rate change by time between KEPAMID PA6 and PA66. The water absorption ratio is measured based on ISO 1110 accelerated moisture ration measurement and PA6 has a higher moisture absorption rate than PA66 in Fig. 3. Moreover, the greater the concentration of glass fiber, the more absorption rate decreases due to glass fiber replacing polyamide content.

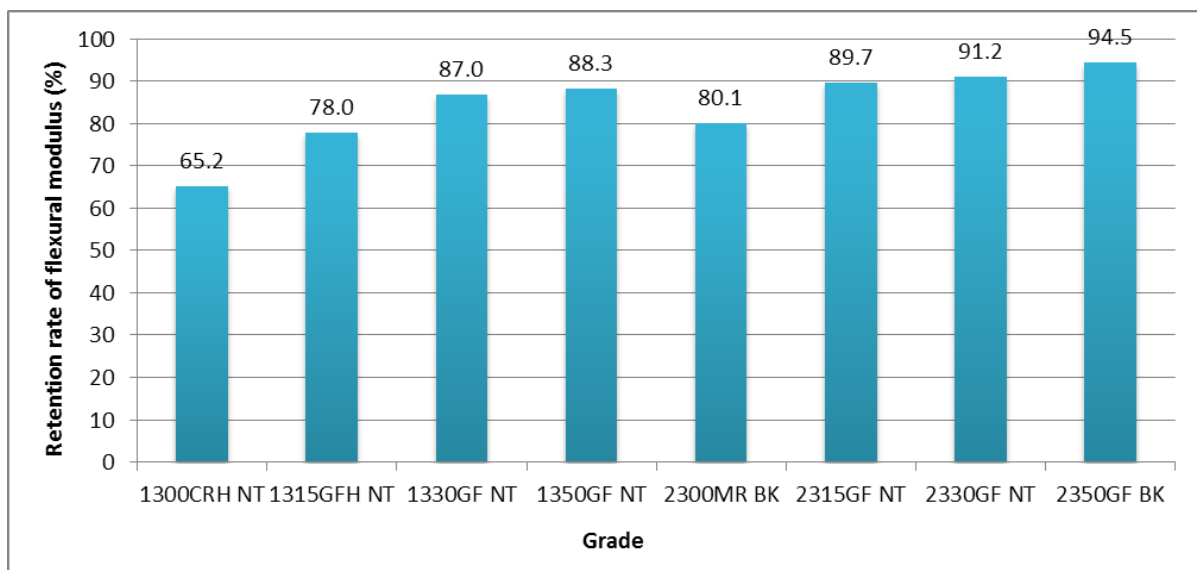


Note 1) Grade description: 1300CRH(PA6 unreinforced), 1315GFH(PA6 G/F 15%), 1330GF(PA6 G/F 30%), 1350GF(PA6 G/F 50%), 2300MR(PA66 unreinforced), 2315GF(PA66 G/F 15%), 2330GF(PA66 G/F 30%), 2350GFH(PA66 G/F 50%)  
 2) Absorption condition: 23 °C, 50% R.H.

Fig.3. PA6 and PA66 water absorption ratio by glass fiber content

## Property change of KEPAMID PA6 and PA66 main grades upon absorption

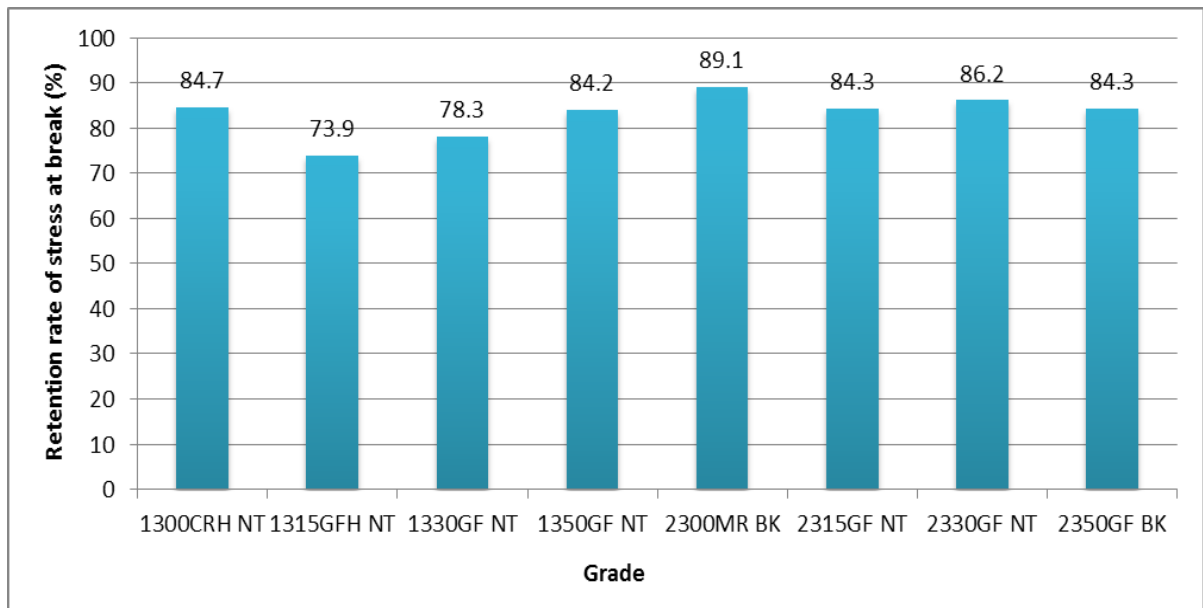
Fig. 4 shows KEPAMID PA6 and PA66's flexural modulus changes before and after water absorption. Flexural strength lowers after absorption and PA66 has better persistency. PA6's property persistency is 65~88% while PA66's is 80~95%.



note 1) Absorption conditions: 23 °C, 50% R.H., 60 days

Fig.4 Flexural modulus changes upon main grades among PA6 and PA66 after absorption

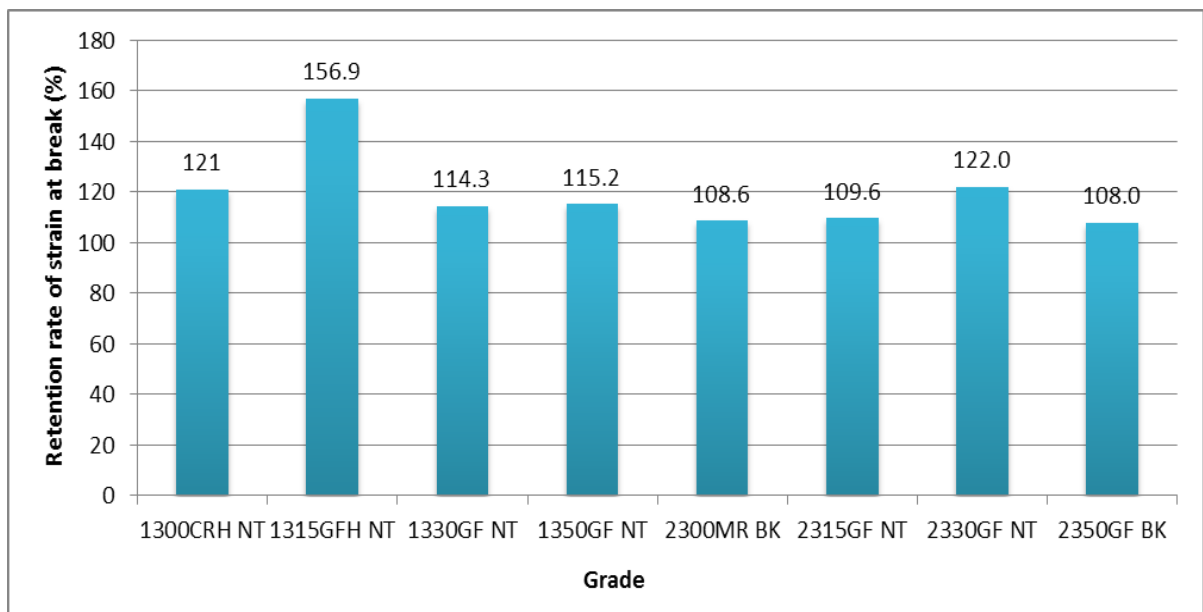
Fig. 5 shows the breaking strength changes before and after moisture absorption. Breaking strength decreases after absorption and PA66 has better persistency than PA6.



note 1) Absorption conditions: 23°C, 50% R.H., 60 days

Fig.5 Stress at break changes upon main grades among PA6 and PA66 after absorption

KEPAMID PA6 and PA66's changes on elongation at break are shown in Fig. 6. Elongation increases after absorption.



Note 1) Absorption conditions: 23°C, 50% R.H., 60 days

Fig.6 Elongation at break change upon main grades PA6 and PA66 after absorption

**HQ**

Mapo-daero 119 (Gongdeok-dong) Hyeoseong Bldg.  
Mapo-gu, Seoul, Korea  
Tel 82-2-707-6840 ~ 8, Telefax 82-2-714-9235

**KEP Americas**

106 North Denton Tap Road Suite 210-202 Coppell,  
TX 75019, USA  
Tel +1 888 KEPITAL, Telefax +1 888 537-3291

**KEP Europe GmbH**

Rheingaustrasse 190-196 D-65203 Wiesbaden, Germany  
Tel +49 (0)611 962-7381, Telefax +49 (0)611 962-9132

**KEP China**

A1905, HongQiao Nanfeng Plaza, 100 Zunyi Road,  
Shanghai, China  
Tel +86 21 6237-1972, Telefax +86 21 6237-1803

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