

Technical Literature H-04

Crystallization Conditions for AURUM[®] Molded Articles

AURUM[®] is a crystalline resin showing the highest attainable crystallization degree of approx. 45%. However, since its crystallization rate is slow, molded articles obtained by injection molding and extrusion become noncrystalline. PL6200 and PL6230 are available as post crystallizable grades, and the general-purpose grades cannot be used for post crystallization because deformation will occur during the post crystallization of the general-purpose grades.

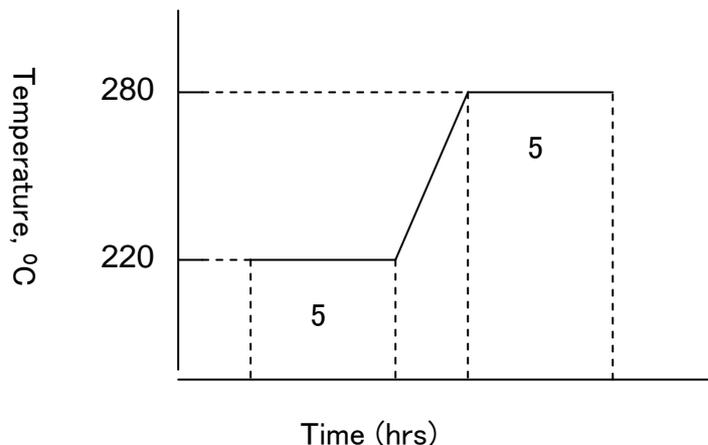
Given below are the conditions for crystallizing noncrystalline molded articles.

Even for those composite materials containing glass fiber, carbon fiber, etc., crystallization conditions are the same. However, conditions may vary to some extent depending on the shape of molded articles. Especially, the maximum wall thickness is 5 mm.

1. Crystallization Conditions

1-1 Crystallization Program

A representative example is shown right.



1-2 Drying

Since AURUM[®] shows a moisture absorption rate of approx. 0.7 (wt%) in a noncrystalline state, it needs to be predried before crystallization.

Meeting the following condition is suffice for the drying purposes:
200°C x 5 hrs

However, in an oven-dry state as immediately after injection molding, this drying step may be omitted:

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1-3 Crystallization

The crystallization of a molded article can be accomplished by heating it to approx. 280°C and leaving it to stand as shown in the data (2-1).

(1) Temperature Conditions

As molded articles have residual stress and a weld line inside them, rapid heating will cause defects such as a deformation of the molded articles, cracks and growth of internal voids. It is necessary for preventing such defects to heat molded articles at 280°C for 5 hours after carrying out heat treatment at 220°C for 5 hour.

(2) Crystallinity

It is necessary for attaining high crystallinity to keep molded articles at a temperature a little lower than the melting temperature for a long time. However, if molded articles are exposed to high temperature for a long time, they will become flowable so that it will become difficult for them to retain their shape. Therefore, as shown in the reference data (2-2), a crystallinity of approx. 30% of molded articles are normally attained by heating at 300 to 320°C for 2 hours or so.

(3) Dimensional Changes

Since the density of the resin becomes higher as it becomes crystalline, a shrinkage in the volume will take place.

<u>Crystallinity (%)</u>	<u>Density (g/cc)</u>
0	1.333
10	1.344
20	1.357
30	1.369
35	1.376

On the other hand, the degree of deformation will vary with the type and content of the filler and the residual stress in the molded articles. If a deformation of a molded article is to be reduced, lower crystallinity should be set for it, and it is necessary to select conditions of lower temperature and shorter time than those conditions given above.

2. Reference Data

2-1 Isothermal Crystallization Time by DSC (Fig. 1)

(Fig 1) not available

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The axis of ordinate represents the time in which the crystallization heat release peak is reached in isothermal crystallization by DSC.

2-2 Relationship between exposure time and crystallinity in crystallization at 300°C (Fig. 2)

(Fig 2) not available

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