CHEMISTRY THAT MATTERS™

NORYL™ AP2001G RESIN PROCESSING GUIDELINES

MIXING IN POLYURETHANE COMPONENTS

SABIC's Specialties Business
Thermosets & Additives

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NORYL™ AP2001G RESIN – PRODUCT DATA

Product Description: NORYL™ AP2001G resin is an aromatic polyether polyol based on polyphenylene ether.

The terminal phenolic hydroxyl end-groups have a fairly high reactivity. It is compatible with a range of polyether polyols and can be blended with other diols or triols to achieve desired product properties. It can be used as a reactive component in a broad range of urethane applications including coatings, adhesives, sealants, elastomers, foams and composites. Use of NORYL™ AP2001G resin may bring improvements in tensile properties, elongation, toughness, tear/abrasion strength, hardness and chemical resistance. In addition, it possess excellent flame retardency which may improve the performance of polyurethanes based on these resins.

Typical Properties of NORYL™ AP2001G Resin in PPG:

Test	Limits	Results	Test Method
Hydroxyl Value, mg KOH/g	-	87.4	Internal Method
Water (wt%)	<0.06	0.03	Karl Fischer Titration
Viscosity at 80 °C, cPs	-	5260	Brookfield Viscometer
Viscosity at 100 °C, cPs	-	1210	Brookfield Viscometer
Appearance at 50 °C	-	Reddish colored viscous liquid	

Typical Properties of NORYL™ AP2001G Resin in PTMG:

Test	Limits	Results	Test Method
Hydroxyl Value, mg KOH/g	-	86.9	SABIC Method
Water (wt%)	<0.06	0.05	Karl Fischer Titration
Viscosity at 80 °C, cPs	-	6410	Brookfield Viscometer
Viscosity at 100 °C, cPs	-	1578	Brookfield Viscometer
Appearance at 50 °C	-	Reddish colored viscous liquid	

PROCEDURE FOR MIXING NORYL™ AP2001G INTO POLYOL COMPONENTS

STEPS:

- Charge vessel equipped with mechanical stirrer, nitrogen inlet and outlet, vacuum line, thermocouple, heating mantle, and a temperature controller with a desired polyol system (Figure 1).
- Pre-heat the polyol component to the desired temperature. For solid NORYL™ resins the polyol temperature should be 100 – 120 °C.
- Once the desired temperature is reached, add NORYL™ AP2001G. Solid NORYL™ resin should be added in stages to avoid phase separation.
- Repeat the previous step, adding solid NORYL™ resin until targeted loading level is achieved. For a 40 wt% solution this is done in twelve equal portions added ten minutes apart.
- Maintain the temperature with agitation until solution is clear and uniform. This typically takes 150 minutes total time at 100 °C.

OTHER CONSIDERATIONS:

- The starting temperature and mixing time will be dependent on the type of the polyol components and the amount of NORYL™ AP2001G resin.
- Gentle heating (40-120 °C) may help reduce the time required to obtain a uniformly mixed NORYL™ AP2001G resin in a chosen polyol system.
- If agglomeration starts to develop, delay adding more solid resin until the material breaks up and dissolves. It will take longer to effect a solution but is the better option than making a large aggregate that will dissolve very slowly.

PROCEDURE FOR MIXING NORYL™ AP2001G RESIN INTO POLYOL COMPONENTS

- Please consider the viscosity curves to identify the highest workable NORYL™ AP2001G resin concentrations (Figure 2 and 3).



Figure 1: The reactor setup (Left) and agitation blade (Right) used in mixing NORYL™ AP2001G resin with polyols.

VISCOSITY OF NORYL™ AP2001G RESIN SOLUTIONS

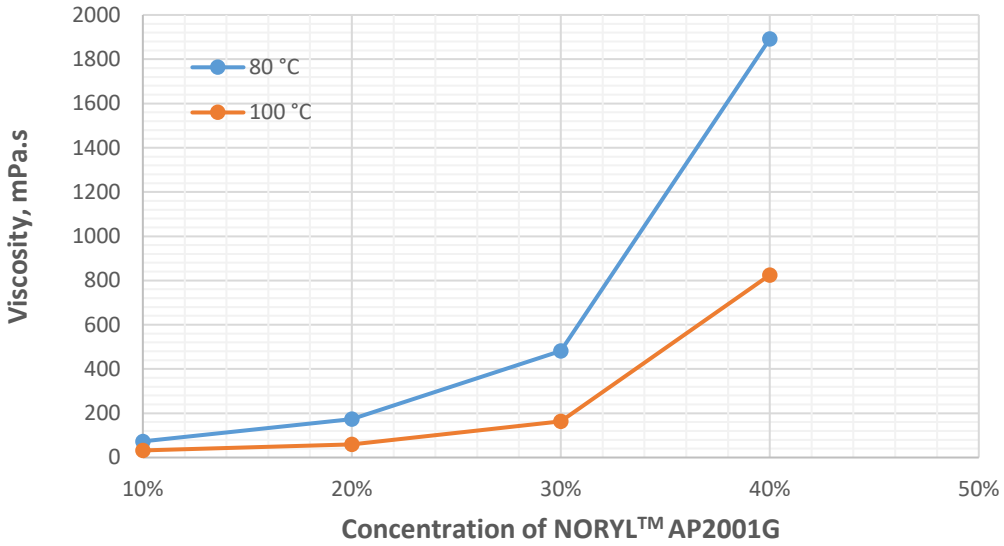


Figure 2: Trend in viscosity vs concentration of NORYL™ AP2001G resin in PPG1000 at 80 °C and 100 °C.

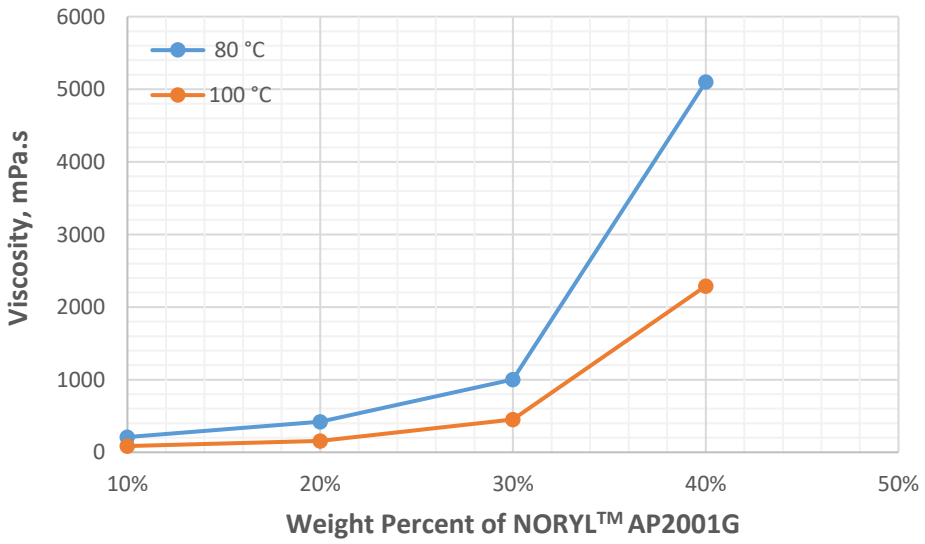


Figure 3: Trend in viscosity vs concentration of NORYL™ AP2001G resin in PTMG1000 at 80 °C and 100 °C.

SHELF LIFE STABILITY OF NORYL™ AP2001G RESIN

The shelf life of AP2001G resin solutions at different temperatures (5 °C, 25 °C and 50 °C) were evaluated. AP2001G resin in PPG or PTMG solution did not show any visible change in appearance even after aging for 4 weeks. However, the PTMG solution upon storage at 5 °C showed signs of crystallization. However, after heating for 20-25 minutes at 100 °C, the crystallized solution melted and formed a clear homogeneous liquid. Hydroxyl value measurements on both resin solutions before and after aging at 50 °C (Table 1), showed negligible changes in hydroxyl values.

Table 1. Hydroxyl values of NORYL™ AP2001G resin (mg KOH/g)

NORYL™ Resin solutions	Initial OH Value, mg KOH/g	OH Value after aging at 50 °C , mg KOH/g
NORYL™ AP2001G resin in PPG	92.1	92.7
NORYL™ AP2001G resin in PTMG	91.1	91.3

NORYL™ AP2001G RESIN HANDLING, STORAGE AND SAFETY

Storage and Safe Handling:

NORYL™ AP2001G resin is slightly hygroscopic and may absorb water. The containers should be resealed tightly after use to prevent contamination by foreign material and exposure to moisture, which can adversely affect product quality. These polyol mixtures can become quite viscous at low temperatures and may separate due to cold. Warm to 50-100 °C to thaw and mix until uniform. For ease of handling, storage temperatures between 25 °C (77 °F) and 50 °C (122 °F) under nitrogen blanket are recommended.

Health and Safety:

Before working with NORYL™ AP2001G resin, you must read and become familiar with the available information on its risks, proper use, and handling. Information concerning the health and safety precautions is available in safety data sheets (SDS) and product labels. For additional information reach out to SABIC Thermoset & Additives Business representative or the Product Safety and Regulatory Affairs Team.

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NORYL RESINS

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