ROHM AND HAAS

ACRYSOL™ RM-825 Rheology Modifier

Description

ACRYSOL RM-825 is a non-ionic urethane rheology modifier, designed for formulating interior/exterior paints ranging from highly structured to paints that portray nearly Newtonian behaviour.

ACRYSOL RM-825 rheology modifier shows a very good balance of low and high shear viscosity. The nature of this balance is dependent on formulations and latex types as described in later sections of this document. This allows the formulation of paints meeting a variety of rheological requirements.

ACRYSOL RM-825 can be used as a co-thickener in many types of formulations for attaining a desired balance of low and high shear viscosities. It has excellent water and alkali resistance.

Characteristics

- Good film build, better hiding with brush and roller
- Resistant to microbial attack
- Excellent water and alkali resistance
- Excellent spatter resistance
- Use over a wide pH range
- Ease of handling

Typical Properties

These properties are typical but do not constitute specifications.

Appearance	Hazy liquid
Solids Content %	25
Brookfield Viscosity	1000-2500 cps
Specific gravity (wet polymer)	1.04
Solvent	Water/Butyl Carbitol (75/25)
Chemistry	HEUR*
Density lb/gal (US)	8.7

*Hydrophobically modified polyethylene oxide urethane

Formulations

Formulations Guidelines

Incorporation

ACRYSOL RM-825 rheology modifier is supplied as a pourable and pumpable liquid and should not need dilution. It can be added to the grind or during letdown. Addition to the grind, prior to dispersing, can accelerate the rate of viscosity equilibration.

The viscosity of ACRYSOL RM-825 increases at lower temperatures. Therefore, if the product has been stored at low temperature, it should be allowed to equilibrate to room temperature before use in order to facilitate handling.

Rheology Profile

High Shear

ACRYSOL RM-825 is moderately efficient in raising the high shear (brushing) viscosity. Viscosity in this region is not very dependent on thickener interactions and is mainly a function of the amount of ACRYSOL RM-825 present.

Should a higher ICI viscosity be desired, then a blend with ACRYSOL RM-2020 or ACRYSOL RM-5000 is recommended. ICI viscosity is not greatly affected by surfactants or water miscible solvents, since these have their primary effect on thickener interactions which influence the Stormer and lower viscosity regions.

Low Shear

ACRYSOL RM-825 efficiently increases low shear viscosity, and the ratio of low shear to high shear viscosity will vary depending on the choice of binder and other formulation components.

Dispersing Agents

Dispersing agents with low ionic content have proven to work well with ACRYSOL RM-825. In most formulations OROTAN™ 731A ER or TAMOL™ 731A ER (in matte to sheen paints) and OROTAN 1124 or TAMOL 1124 (in semi-gloss paints) have been found to give good results in systems thickened with ACRYSOL RM-825.

For high-gloss paints, however, when enamel binders are used, OROTAN 681 or TAMOL 681 is recommended. It shows a superior overall performance, and acting like flow modifiers, give a greater degree of gloss reproducability.

Surfactants, Wetting Agents and Cosolvents

Excessive amounts of surfactants, wetting agents or cosolvents can slow down the viscosity equilibration by competing with rheology modifier hydrophobes for association sites, or in the case of cosolvents interfering with micelle formation.

However, these mechanisms can be manipulated in order to adjust the rheological profile of a paint formulation.

If the high shear viscosity is acceptable, but the Stormer viscosity is too high, it is not necessary to change the level of ACRYSOL RM-825. The thickener interactions which contribute to the low shear viscosity can be reduced through the use of water miscible cosolvents or surfactants.

Figure 1 demonstrates the effect of several different water-miscible solvents on the viscosity of a paint formulation based on PRIMAL™ AC-261K.

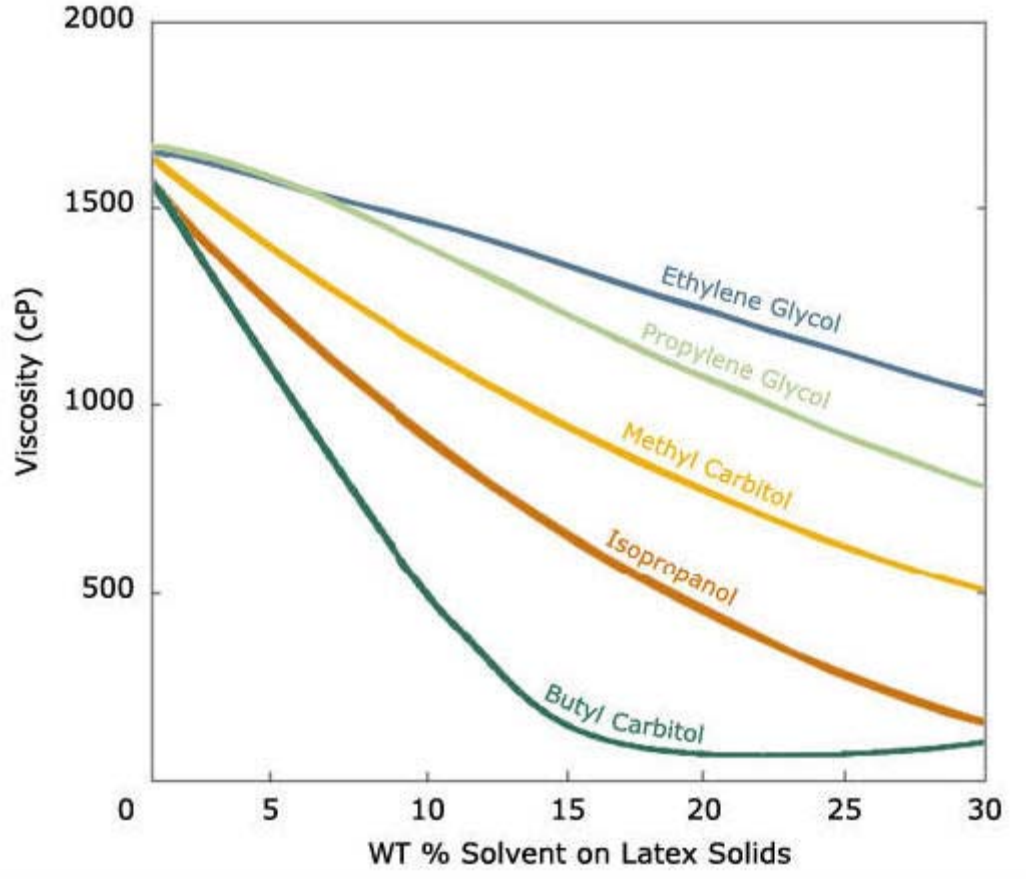

Figure 1: Response of Viscosity to Solvents
(32% volume solids blends of PRIMAL AC-261K and ACRYSOL RM-825)

As shown in the figure, Diethylene glycol monobutyl ether (DGBE) such as Butyl Carbitol, is very effective in reducing low shear viscosity.

ACRYSOL RM-825 is supplied in a 25% solution of DGBE to minimise handling viscosity, and additional DGBE can be added to the paint formulation as necessary to suppress the KU viscosity.

The viscosity suppression shown in Figure 1 can be expected to carry through to a paint formulation, but since the effect is cumulative with other paint components, it is necessary to test the specific formulation. In formulations requiring a powerful coalescent such as Texanol, the additional DGBE is not an effective substitute for the Texanol. Neither will the Texanol be effective in reducing the low shear viscosity.

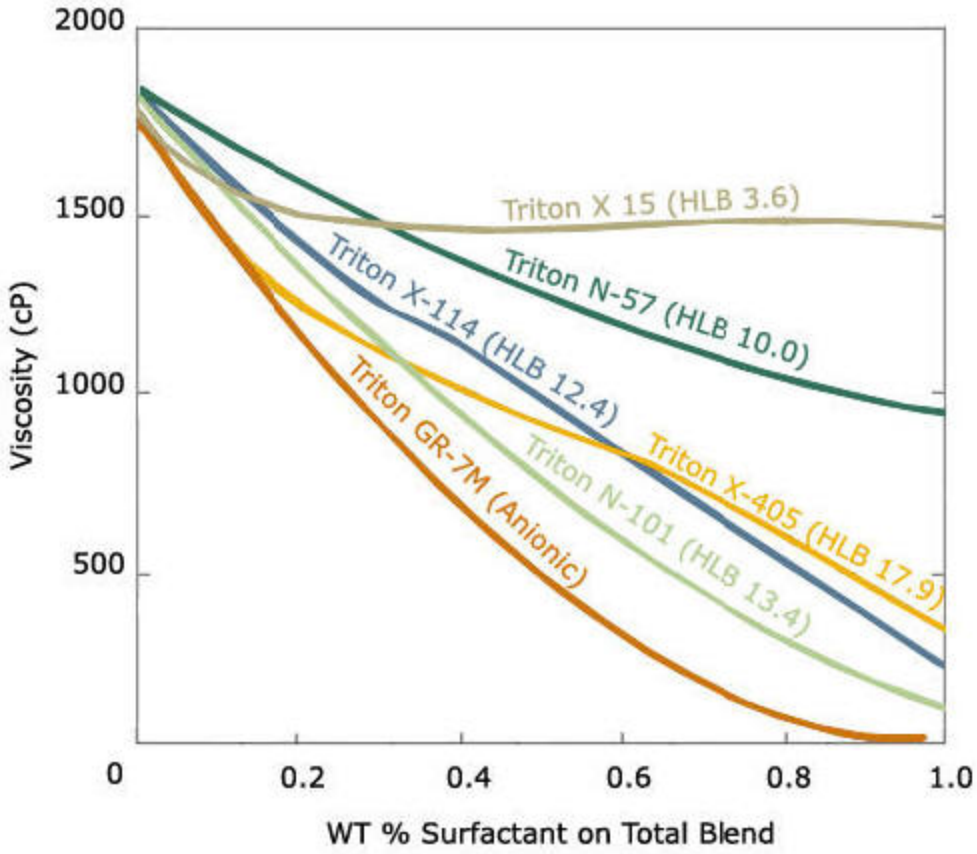

Figure 2: Response of Viscosity to Surfactants
(32% volume solids blends of PRIMAL AC-261K and ACRYSOL RM-825)

If the high shear viscosity is acceptable but the low shear viscosity is too low, it is possible that ingredients already present in the formulation are reducing the thickener interactions of ACRYSOL RM-825. In this case, low shear viscosity can be increased by reducing the levels of water-miscible cosolvents and/or surfactants.

The excellent flow properties of ACRYSOL RM-825 allow for significant reduction in glycol levels without sacrificing open time.

Paint pH Control

In some formulations a high pH can cause polymer swelling. In turn, this can lead to high viscosity paints and instability. For this reason, paints thickened with ACRYSOL RM-825 rheology modifier are best formulated at around pH 8.0.

Acrylic paints are typically formulated at pH 8.0-9.0, but for non acrylic based paints, manufacturers recommended pH should be followed.

Interactive Effects of the Paint System

The rheology modifying mechanism of ACRYSOL RM-825 is primarily associative. Hydrophobic elements of the molecular structure tend to associate with other hydrophobic elements in the paint. These other hydrophobic elements are mostly latex binder and opaque polymers.

Association with anorganic pigments is less frequent, but can exist. In the end, we get a network of associations, modifying the rheological profile of the paint and giving it the desired flow.

However, associative also means that the rheology of the paint is influenced by a whole range of elements other than the thickener itself. The following factors have a direct impact on the efficiency of ACRYSOL RM-825 in latex paints:

- Latex polymer particle size and distribution
- Latex polymer composition
- Surfactants and cosolvents

Latex Polymer Particle Size and Distribution

The primary site for the associative characteristics of a rheology modifier is the surface of the binder particles. As a consequence, a greater surface area will lead to stronger association. Greater association leads to an increased efficiency. For a given volume of unimodal latex binder, a small particle size binder will have a greater total surface area than a larger particle size binder. Thus, the rheology modifier will work more efficiently with the smaller particle size binder.

When a binder contains a distribution of particle sizes, the answer is not as clear. Here the distribution of particle sizes from large to small will determine the associative conditions more realistically than average particle size.

Latex Polymer Composition

ACRYSOL RM-825 is most efficient with hydrophobic latexes. This hydrophobicity may vary with the latex composition or the stabilising system.

Surfactants

The hydrophobic nature of surfactants allows them to compete with the associative capacity of the rheology modifier for the latex polymer surfaces. If the surfactant is able to displace the rheology modifier, the viscosity that is inherent to the rheology modifier polymer interaction can be reduced considerably. This means that special attention is needed for the type and amount of surfactant that is used, and to the combination with the binder.

In addition, consideration must be given to the surfactants introduced with the colourant system. Predispersed colourants generally contain surfactants for stability and to facilitate colour acceptance. Each colourant may have a different type and level of surfactant.

Cosolvents

Water insoluble cosolvents, such as Texanol, have little or no effect on the medium shear viscosity of a paint thickened with an associative thickener. Water soluble cosolvents, however, may reduce the low shear viscosity. Products such as ethylene glycol and propylene glycol will have the least effect, while Butyl Carbitol will have the greatest effect among the cosolvents tested to date. As in the case of surfactants, the level of cosolvent that is introduced with a predispersed colourant must be accounted for.

One outcome of this cosolvent interaction is the potential to use these products for low shear viscosity adjustments. This can be done very effectively, but with a cost penalty and a potential reduction in water resistance due to the water solubility of these products.

Safe Handling Information

Rohm and Haas Company maintains comprehensive and up-to-date Material Safety Data Sheets (MSDS) on all of its products. These sheets contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products.

Rohm and Haas Company recommends that you obtain copies of our Material Safety Data Sheets from your local Rohm and Haas representative on each of our products prior to its use in your facilities. We also suggest that you contact your supplier of other materials recommended for use with our products for appropriate health and safety precautions prior to their use.

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