Technical Data Sheet

ACRYSOL™ RM-5000 Rheology Modifier

For water based paint applications

Regional Product Availability

EMEA

Description

ACRYSOL™ RM-5000 Rheology Modifier is a non-ionic urethane rheology modifier, based on a new solvent-free* technology with improved binder association . It offers a newtonian rheology profile for excellent flow and levelling, high film build, combined with excellent water and alkali resistance.

The improved binder association facilitates the desired results achieved at low dosages of the rheology modifier (Fig. 1).

It is specifically designed for applications where a low odour or low VOC is required. However, ACRYSOL™ RM-5000 Rheology Modifier is also suggested in a wide range of matt through high gloss paints and lacquers. It can be used either alone or in combination with thickeners effective in the low shear range to reach the desired balance of flow and sag resistance. ACRYSOL™ RM-5000 Rheology Modifier can be used as a sole thickener in high gloss paints to achieve optimum flow properties.

The use of co-solvents for optimising some formulations, does not adversely affect the efficiency of ACRYSOL™ RM-5000 Rheology Modifier.

Performance Features

- High efficiency
- Excellent flow and levelling
- High and sharp gloss development
- Solvent-free* - low odour
- Broad formulation latitude
- Use over a wide pH range
- Resistant to microbial and enzymatic attack
- Ease of handling

* Solvent is not intentionally added and is not knowingly introduced from another raw material.

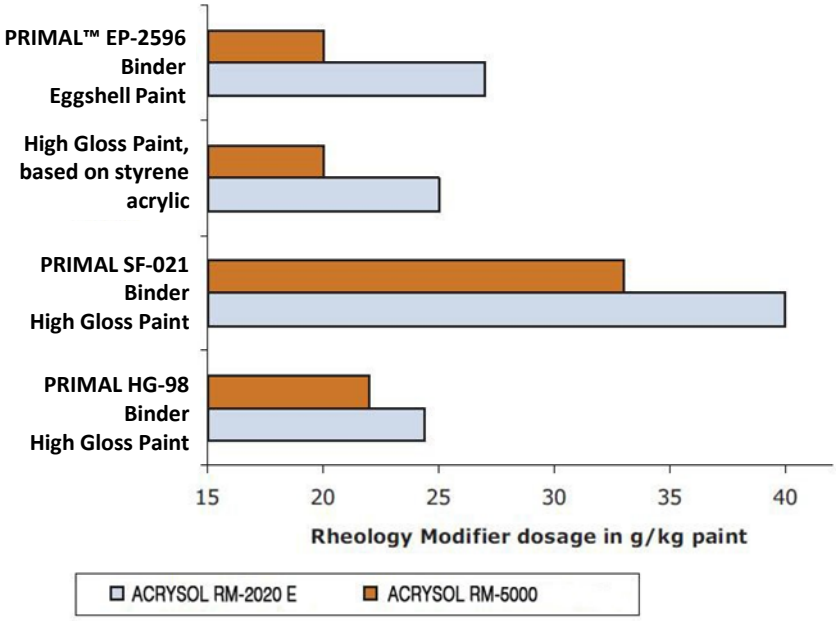
Typical Physical Properties

The following properties are typical but should not be regarded as specifications

Property	Typical Values
Appearance	Milky white liquid
Solids content, %	18.5
Brookfield Viscosity (LVF, spindle 2 at 6 rpm), cP	2000–4000
Specific gravity (wet polymer)	1.045
Solvent	Water
Chemistry	HEUR*

*Hydrophobically modified polyethylene oxide urethane

Figure 1: Required Dosages of HEUR-Rheology Modifiers to Achieve the Desired High Shear Viscosity of Our Standard Formulations



Applications

ACRYSOL™ RM-5000 Rheology Modifier can be applied in a wide range of different paint formulations with low volatile organic content, zero formaldehyde and zero free ammonia. It is particularly efficient in the following types of formulations:

- Paints based on no added solvent latex binders.
- High opacity, high build coatings for exterior mineral substrates where improved hiding and excellent exterior durability (alkaline and water resistance) are essential.
- For interior wall paints, ACRYSOL RM-5000 Rheology Modifier is compatible with all types of emulsions, allowing formulations with excellent technical performance as well as great application properties.
- In gloss paints it is suggested to be used in combination with small particle size hydrophobic, acrylic gloss binders. The remarkable flow and levelling properties imparted by ACRYSOL™ RM-5000 Rheology Modifier, combined with its strong gloss development, make it suitable for these applications.
- For waterborne industrial coatings (e.g. wood coatings, furniture coatings, metal coatings) where high requirements need to be met to offer excellent application and final coatings surface properties.
- In overprint varnishes to achieve a great rheological profile.
- In traffic paints to improve application and film build.

Formulating Guidelines

Incorporation

ACRYSOL™ RM-5000 Rheology Modifier is supplied as a pourable and pumpable liquid, free of added solvent and with very low odour. It can be added to the mill-base or during letdown. Suggested dosage is dependent on the formulation and can vary from 0.2 to 5 % on total weight of the formulation.

Rheology Profile

ACRYSOL™ RM-5000 Rheology Modifier imparts a newtonian rheology profile to a paint. In gloss and semi-gloss paints this is suitable for giving the excellent flow and levelling properties required for brush application.

For roller application, however, it is suggested to use it in combination with other thickeners. A more pronounced structure is obtained by adding some ACRYSOL™ RM-825, ACRYSOL™ RM-8W and especially the efficient ACRYSOL™ RM-845 Rheology Modifier, depending on the amount added.

Dispersing Agents

In most formulations OROTAN™ 731A ER Pigment Dispersant (in matt to gloss paints) and OROTAN™ 1124 Pigment Dispersant (in semi-gloss paints) offer excellent results in combination with ACRYSOL™ RM-5000 Rheology Modifier.

For high-gloss paints, enamels or industrial coatings, OROTAN™ 681 and OROTAN™ 165 Pigment Dispersant are suggested. They show a excellent overall performance and act as flow- modifiers, giving a great degree of gloss reproducibility.

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 containing ACRYSOL™ RM-5000 Rheology Modifier are best formulated at around pH 8.0.

In ammonia-free, low VOC formulations, it has been proven that permanent bases like sodium or potassium hydroxide or amines maintain the pH and therefore improves the stability.

Interactive Effects of the Paint System

The rheology modifying mechanism of ACRYSOL™ RM-5000 Rheology Modifier 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 inorganic pigments is less frequent, but can exist. The resulting network of associations modifies the rheological profile of the paint and offers the desired flow.

Due to the associative mechanism 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-5000 Rheology Modifier in paints:

- Polymer particle size and distribution
- Polymer composition
- Polymer stabilization
- Surfactants and co-solvents

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. Due to the greater total surface area of a small particle size binder, the rheology modifier will work more efficiently with it than with a large 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.

Polymer Composition
ACRYSOL™ RM-5000 Rheology Modifier is most efficient with hydrophobic polymers. This hydrophobicity may vary with the polymer composition or the stabilising system.

Polymer Stabilization
Surfactant stabilized latex: in general, the experience shows that the surfactant commonly used in the latex stabilization does not prevent the hydrophobes from being adsorbed at the surface of the latex.

Steric or colloidal stabilization: it surrounds the latex particle with a highly hydrophilic protective layer. Therefore the affinity of the hydrophobes for the latex is very weak and the viscosity development low.

Surfactants
The hydrophobic nature of surfactants permits them to compete with the associative capacity of the rheology modifier for the binder 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 for 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.

Co-solvents
Water insoluble co-solvents have little or no effect on the medium shear viscosity of a paint thickened with an associative thickener. Water soluble co-solvents, however, may reduce the low shear viscosity.

Products such as ethylene glycol and propylene glycol will have the least effect, while butyl CARBITOL™ Solvent will have the greatest effect among the co-solvents tested to date. As in the case of surfactants, the level of co-solvent that is introduced with a predispersed colourant must be accounted for.

One outcome of this co-solvent 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.

Handling Precautions

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

Storage

Store products in tightly closed original containers at temperatures recommended on the product label.

Disposal Considerations

Dispose in accordance with all, local or national regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local or national regulations. Contact your Dow Coating Materials Technical Representative for more information.

Chemical Registration

Many countries within EMEAI require the registration of chemicals, either imported or produced locally, prior to their commercial use. Violation of these regulations may lead to substantial penalties imposed upon the user, the importer or manufacturer, and/or cessation of supply. It is in your interests to ensure that all chemicals used by you are registered. Dow does not supply unregistered products unless permitted under limited sampling procedures as a precursor to registration.

Note on EMEAI Product Line

Product availability and grades vary throughout the countries in the EMEAI area. Please contact your local Dow Coating Materials representative for further information and samples.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

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