



Technical Data Sheet

ROPAQUE™ Ultra E Opaque Polymer

For Formulation Cost Savings and Improved Coating Performance

Regional Product Availability

EMEA

Description

ROPAQUE™ Ultra E is one of the most advanced polymeric opacifiers engineered to improve the efficiency of TiO₂. It facilitates paint application and performance improvements, lowers the consumption of TiO₂ and reduces the cost of all types of water based paints.

In addition to providing the most efficient dry-hiding properties, ROPAQUE Ultra E Opaque Polymer offers wide range benefits in interior and exterior paint formulations.

Benefits of the Product

- Allows partial replacement of TiO₂
- Lowers TiO₂ demand and formulation cost
- Improves paint application and performance properties
- Wide formulation latitude from low to high PVC paints
- APEO and ammonia-free*
- Low VOC
- Lower carbon footprint compared to TiO₂

*APEO and ammonia are not intentionally added and are not knowingly introduced from another raw material.

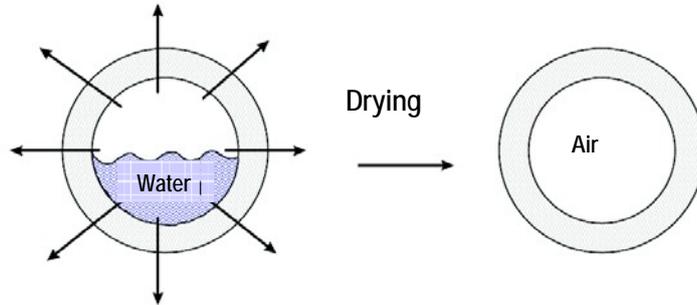
Typical Physical Properties

(The following properties are typical but do not constitute specifications)

Solids content by weight %	30
Solids content by volume %	52.1
Specific gravity of Latex at 25°C	1.025
Specific gravity of dry polymer at 25°C	0.591
pH	8.0–8.7
Average particle size	0.40 µm
Void fraction	44%
Brookfield Viscosity (60 min ⁻¹ , Spindle #2)	<500 mPa·s

Introduction

ROPAQUE™ Opaque Polymers are non-film-forming, emulsion polymers, containing a water filled void. During the drying process of the paint, the water in the void diffuses through the polymer shell and leaves an air void. Due to the difference in refractive index between air and the surrounding polymer, light is effectively scattered, contributing to film opacity.

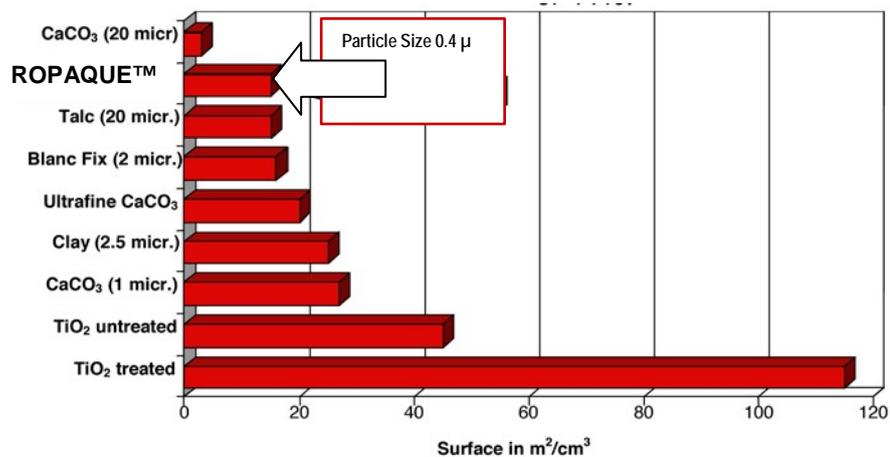


ROPAQUE Opaque Polymers have a narrow particle size distribution and are similar in size to TiO₂ particles. This allows them to act like ultra fine inorganic extenders, spacing TiO₂ effectively and therefore increasing its efficiency as a primary pigment.

Compared to inorganic small particle size pigment extenders, ROPAQUE Organic Opacifiers have a very low specific surface area due to their uniform, spherical shape and non-porous surface. The binder demand of ROPAQUE is therefore significantly lower, giving the possibility of formulating at higher pigment volume concentrations.

The combined effect of these three product features can be used by paint formulators to either reduce paint cost without negative effect on paint performance, or alternatively, improve paint performance without increasing costs.

Light scattering theory shows that the two parameters most impacting the hiding efficiency are the particle size of the hollow spheres and the void fraction. The optimum light scattering efficiency is obtained at a particle diameter of roughly 0.40 μm. The innovative process used to manufacture ROPAQUE Ultra E Opaque Polymer enables an optimum particle size (0.38 μm) with a maximised void fraction of 44%.



How to Introduce
ROPAQUE™
Ultra E Opaque
Polymer in your
Paint Formulation

ROPAQUE™ Ultra E Opaque Polymer offers the possibility of increasing your savings. This means some reformulation work, but is definitely worth the effort: We suggest taking advantage of our computer reformulation support to introduce ROPAQUE Ultra E Opaque Polymer. Please contact our Sales Representative to obtain this support. The guidelines to reduce costs in the tables on the following pages will help to develop starting point reformulations, but are unlikely to fully optimize paints.

Ingredients	Action
TiO ₂	Reduce TiO ₂ by 15–30% of its initial PVC
ROPAQUE™ Ultra E Opaque	Introduce ROPAQUE Ultra E Opaque Polymer 3–4 times the PVC of TiO ₂ Removed
Extenders	Adjust extenders so that total PVC is 4–6 PVC higher than the original paint. Generally reduce fine extenders and adjust total PVC with the large extenders
Dispersant	Adjust dispersant level keeping it constant on total pigment and extenders
Coalescent	Adjust coalescent level keeping it constant on binder and ROPAQUE Ultra E Opaque Polymer solids
Other ingredients	All other ingredients should remain constant per liter of paint. The volume solids is constant

The resulting formulation could require fine tuning, for which we suggest the following guidelines.

Issue	Recommendation
Gloss and sheen increase	Adjust large/fine extenders ratio decreasing the fine extenders
Wet hiding decrease	Adjust TiO ₂ / ROPAQUE Ultra E Opaque Polymer ratio, increasing the amount of TiO ₂
Dry hiding adjustment	Adjust TiO ₂ / ROPAQUE Ultra E Opaque Polymer ratio and play on extenders package
Scrub resistance decrease	Limit total PVC increase to 3%

Example of a
ROPAQUE™
Ultra E
Opaque Polymer
Reformulation

The objective here is to obtain the same overall performance and to lower the total formulation cost. The reformulation below has been done on an exterior house paint formulation based on PRIMAL™ SG-380 Pure Acrylic Binder..

	Without OP	ROPAQUE™ Ultra E Opaque Polymer
TiO ₂ PVC	20.0	16.0
Micro Mica PVC	12.0	11.0
Ultra E PVC	0.0	11.0
Total PVC	32.0	38.0
Total VS	35.0	35.0
Tint Strength		
Blue	33.6	34.0
Yellow	63.9	64.7
Grey	36.4	37.4
Gloss 20°	5.4	5.4
Gloss 60°	34.6	33.7
Gloss 80°	79.1	78.7

This reformulation leads to a cost reduction of about several percentage while maintaining other paint performance.

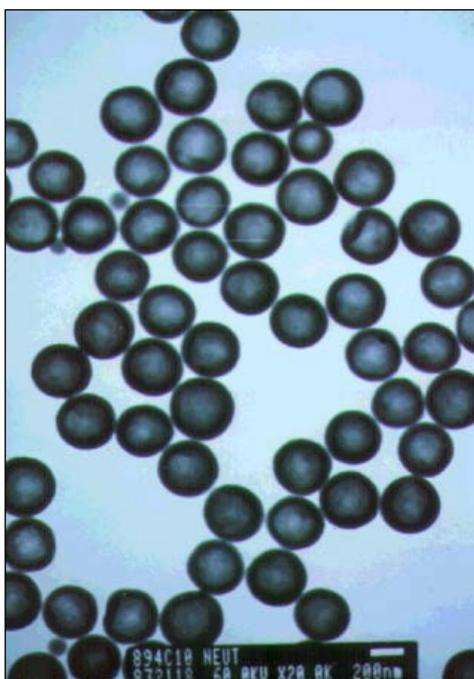
Example of a
ROPAQUE™
Ultra E
Opaque Polymer
Reformulation
(Continued)

The introduction of ROPAQUE™ Ultra E Opaque Polymer into existing formulations to reduce costs requires changes in most other formulation ingredients. We suggest taking advantage of our computer reformulation support to introduce ROPAQUE Ultra E Opaque Polymer into existing formulations with the objective of reducing costs. Please contact our Sales Representatives to obtain this support.

ROPAQUE™ Ultra
E Opaque
Polymer
Characteristics

Consistent Product Quality

Dow's long experience with opaque polymer technology has enabled the development of robust production processes leading to consistent product quality. The particle size distribution for instance is key, and a narrow distribution leads to maximum light scattering efficiency.



To maintain the unique performance features of ROPAQUE™ Ultra E Opaque Polymer in paint formulations, Dow has established a sophisticated quality management system which minimizes variation in the production process and seeks continuous improvement in the system. The use of global Quality Control Systems (QCS), Statistical Quality Control (SQC), and Product and Process Quality Measurement (PPQM) ensures the consistency of ROPAQUE Ultra E Opaque Polymer's quality and performance, no matter where or when it is produced in our global operations.

Exterior Applications

Over the years, Dow scientists have compiled extensive data from Dow exposure sites confirming the benefits of using ROPAQUE™ Opaque Polymer in exterior coatings. In particular improved resistance to dirt pick up, reduction of mould and algae growth and superior color retention are the main benefits observed on numerous wood or masonry exterior coatings containing ROPAQUE Opaque Polymer.

Interior Applications

The lower levels of TiO₂ and extender in paints containing ROPAQUE™ Opaque Polymer offer less loose particles available to abrade the paint film. The lower binder demand of ROPAQUE Ultra E Opaque Polymer vs. TiO₂ particles also leads to enhanced mechanical properties including scrub resistance. The overall effect improves washability.

Interactions with Other Paint Ingredients

The hiding properties of ROPAQUE™ Ultra E Opaque Polymer depend on the integrity of the hollow sphere in the paint film. All ROPAQUE Opaque Polymers can be affected by solvents, white spirit and plasticizers.

As with all ROPAQUE products, except with the ROPAQUE Dual Opaque Polymer resistant to solvents, avoid using white spirits and plasticizing solvents. The aromatic contents of white spirits and many monomeric plasticizers have similar solubility parameters as

ROPAQUE Ultra E Opaque Polymer. This can soften the polymer shell and cause the collapse of the spheres during film formation.

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.

CAUTION! Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

CAUTION! Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.

Storage

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

Disposal

Dispose in accordance with all local, state (provincial) and federal 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, state (provincial) and federal regulations. Contact your Dow Coating Materials Technical Representative for more information.

Chemical Registration

Many countries within the EMEA 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. The Dow Chemical Company does not supply unregistered products unless permitted under limited sampling procedures as a precursor to registration.

Note on EMEA Product Line

Product availability and grades vary throughout the countries in EMEA. 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.

For more information visit our website: www.dow.com/coating or call:

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*) International toll free from Austria, Belgium, Denmark, Finland (prefix 990), France, Germany, Hungary, Ireland, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom

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