

# CAB-O-SIL® FUMED SILICA IN HIGH SOLIDS POLYESTER COATINGS

## Application Description

High solids polyester coatings continue to gain acceptance over standard polyester coatings due to increasingly stringent regulations of Volatile Organic Content (VOCs).

In high solids coatings, preventing pigment settlement during storage and film sagging during heat cure are key challenges.

Conventional coatings are often supplied at relatively high solids levels to minimize the amount of solvent content in formulation. Solvent is added at the application site to reduce viscosity to a sprayable level. High solids coatings, on the other hand, are frequently supplied at relatively low viscosity and no solvent is added later. Pigment settling is a significant problem in these lower viscosity coatings.

During the heat curing cycle of a conventional coating, the viscosity drop associated with increased temperature is offset by the evaporation of solvent. In high solids coatings, however, the evaporation of the lower percentage of solvent cannot offset the viscosity drop associated with heating, and so the coating often sags during heat cure.

CAB-O-SIL fumed silica is an extremely effective thixotrope that can be used to solve both of these problems, by imparting anti-sag and anti-settling properties.

## High Solids Polyester Coatings that Can Use Hydrophilic Fumed Silica Include:

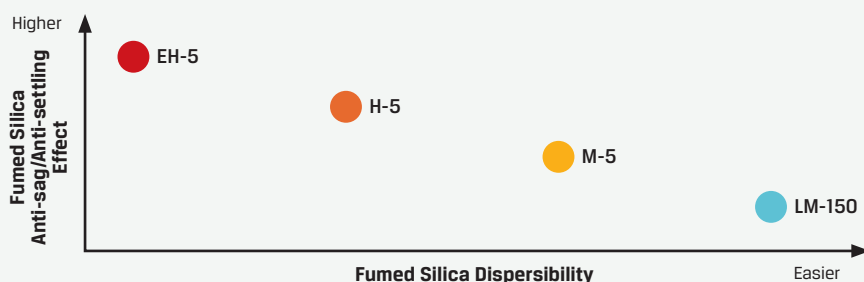


## CABOT PRODUCT OFFERING

| Material Category        | CAB-O-SIL Fumed Silica Product | Typical Surface Area m <sup>2</sup> /gram | Product Characteristics                                                                                                                                                   |
|--------------------------|--------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hydrophilic Fumed Silica | EH-5                           | 380                                       | Higher surface area fumed silicas deliver a much greater thickening effect, but they require greater dispersion energy and can re-agglomerate if not properly stabilized. |
|                          | H-5                            | 300                                       |                                                                                                                                                                           |
|                          | M-5                            | 200                                       |                                                                                                                                                                           |
|                          | LM-150                         | 160                                       |                                                                                                                                                                           |

The data in the table above are typical test values intended as guidance only, and are not product specifications. Product specifications are available from your Cabot representative.

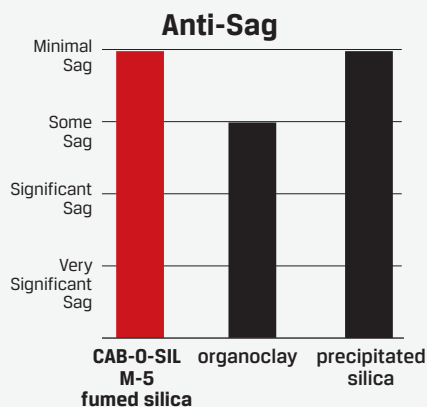
## PRODUCT PERFORMANCE



The effectiveness of fumed silica as a rheological additive is highly dependent on adequate dispersion. Cabot's CAB-O-SIL M-5 fumed silica offers an excellent balance of dispersability and rheological performance. In instances where greater anti-settling and anti-sag performance is desired, CAB-O-SIL EH-5 and H-5 fumed silicas may provide better results. CAB-O-SIL LM-150 silica may be used in instances where CAB-O-SIL M-5 fumed silica cannot be dispersed.

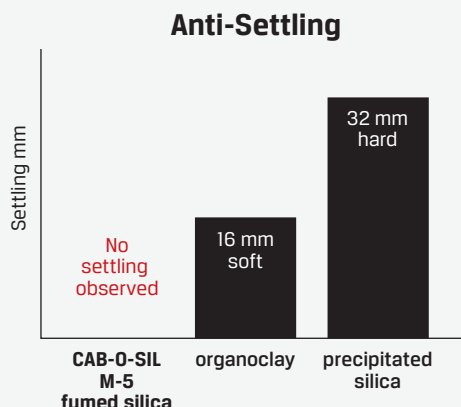
### PRODUCT PERFORMANCE

Three common rheology additives, CAB-O-SIL M-5 fumed silica, precipitated silica and an organoclay, were compared in a high solids polyester formulation. CAB-O-SIL M-5 fumed silica provides the best anti-sag and anti-settling performance and the best gloss retention compared to the competitive materials evaluated in this model formulation. CAB-O-SIL M-5 fumed silica was used at .17% loading, organoclay was used at .5% loading and precipitated silica was used at .98% loading with respect to the finish formulation.



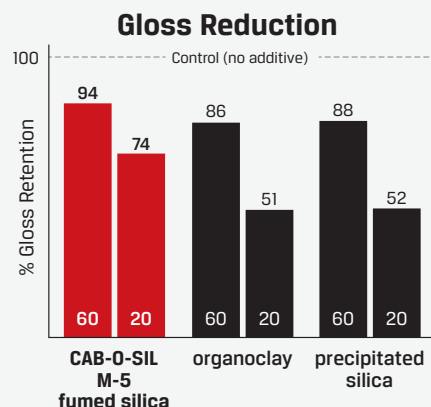
**Conditions:** Spray panel at 1.5 mil

Both CAB-O-SIL M-5 fumed silica and precipitated silica enabled good sag resistance. Some sag was observed in the formulation with organoclay.



**Conditions:** 45 day shelf storage at ambient temperature

CAB-O-SIL M-5 fumed silica provides the best anti-settling performance. Soft settling was observed in the formulation with organoclay. Hard settling, which could not be re-dispersed, was observed in the formulation utilizing precipitated silica.



**Conditions:** 60° and 20° gloss readings % vs. control

CAB-O-SIL M-5 fumed silica provides superior gloss performance. Gloss was significantly reduced in formulations including organoclay and precipitated silica.

The product performance results for CAB-O-SIL M-5 fumed silica was obtained using the model formulation that follows. Only the rheology additive was changed.

### MODEL FORMULATION

#### High Solids Polyester Formulation

| Grind portion                  |                  |               |
|--------------------------------|------------------|---------------|
| Product Name                   | Description      | Amount (%)    |
| Polyester 5771                 | Binder           | 33.14         |
| Ethylene Glycol Monoethylether | Co-solvent       | 5.52          |
| Surfynol PC                    | Defoamer         | 0.22          |
| TiO <sub>2</sub>               | Titanium Dioxide | 60.77         |
| CAB-O-SIL M-5                  | Fumed Silica     | 0.35          |
| <b>Total</b>                   |                  | <b>100.00</b> |

- Mix the grind portion with high speed DISPERMAT® mixer until a Hegman gauge reading of 7.5 is achieved.

| Letdown portion                      |               |               |
|--------------------------------------|---------------|---------------|
| Product Name                         | Function      | Amount (%)    |
| Polyester 5771                       | Resin         | 32.15         |
| Cymel 303                            | Resin         | 26.18         |
| BYK® VP 451                          | Acid Catalyst | 2.25          |
| Methyl Ethyl Ketone                  | Co-solvent    | 5.36          |
| N-Butyl Acetate                      | Co-solvent    | 32.28         |
| N-Butanol                            | Co-solvent    | 1.07          |
| 10% Silwet® L-722 in N-Butyl Acetate | Wetting agent | 0.71          |
| <b>Total</b>                         |               | <b>100.00</b> |

- Mix under good agitation until homogeneous

| Finish formulation |               |
|--------------------|---------------|
| Component          | Amount (%)    |
| Grind              | 49.15         |
| Letdown            | 50.85         |
| <b>Total</b>       | <b>100.00</b> |

- Mix under good agitation for 20 minutes

