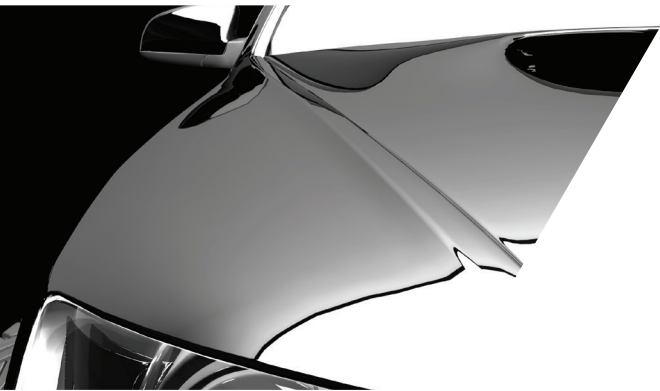




FUMED METAL OXIDES

HIGH PERFORMANCE RHEOLOGY MODIFIERS FOR INDUSTRIAL AND AUTOMOTIVE COATINGS





We can help you achieve your performance goals for industrial and automotive coatings. Our technical service and applications development specialists are ready to find a tailored solution for your needs. For more information on our products for coatings applications, contact your Cabot representative or visit cabotcorp.com/coatings

Introduction

Coatings for industrial and automotive applications demand strong aesthetic properties as well as robust functional attributes. The coating has to be visually attractive – achieving optimal color, gloss, haze and smoothness with minimal imperfections – while also being easy to handle and apply. To strike the right balance, the choice of additives used in the coatings formulation is critical. Leading coating companies and formulators trust our high performance treated hydrophobic fumed silica rheology modifiers to create products with the precise properties that their customers demand.

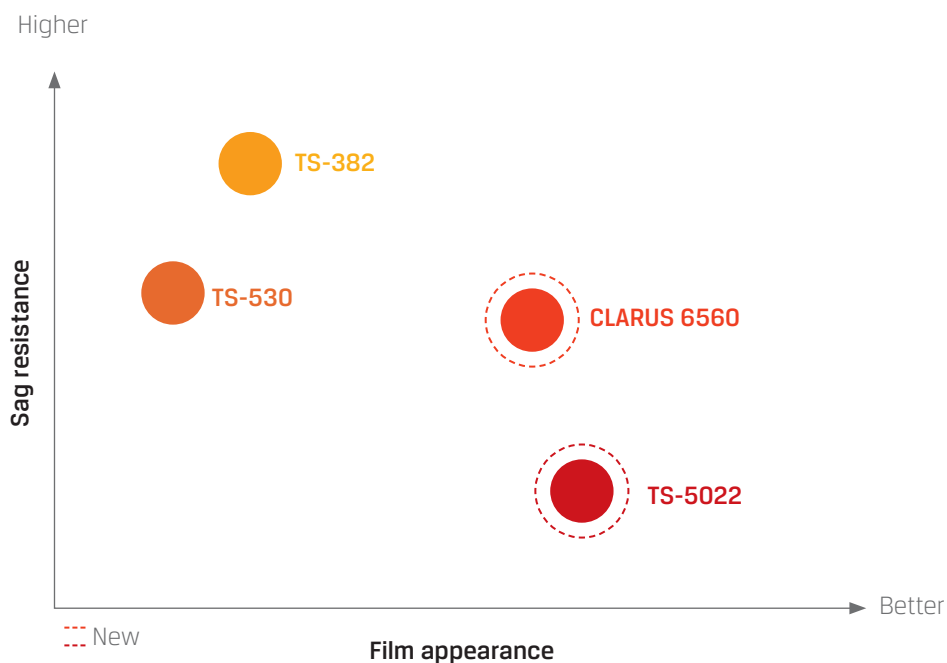
Our treated hydrophobic fumed silicas: performance that makes a difference

Our portfolio of treated silica rheology modifiers for industrial and automotive coatings imparts performance attributes required by your coatings formulation, including:

- ◆ **Sag resistance:** Influenced by the rheological properties (viscosity, response to stress) that the silica imparts through its interaction with the rest of the coatings ingredients.
- ◆ **Film appearance:** Complex interplay of several properties including haze, gloss, solvent popping, orange peel, etc.

We have expanded our portfolio of treated silica rheology modifiers for industrial and automotive coatings by adding CAB-O-SIL® TS-5022 and CLARUS™ 6560 products. These products provide additional choices to further enable you to strike the right balance between sag resistance and film appearance in your applications.

Performance comparison of CAB-O-SIL treated silicas in clear acrylic and pigmented alkyd coatings



Our product offerings

Treated silica product	Treatment agent	Value proposition	BET SA (m ² /g)	% Carbon
CAB-O-SIL® TS-382	Octylsilane (C8)	Excellent anti-sag properties	150 +/- 25	6.5 +/- 1
CAB-O-SIL TS-530	Hexamethyldisilazane (HMDZ)	High anti-sag properties	225 +/- 20	4.25 +/- 0.5
CAB-O-SIL TS-5022	Hexamethyldisilazane (HMDZ)	Suitable for use in applications requiring exquisite film appearance and moderate sag resistance	250 +/- 30	2.5 +/- 0.4
CAB-O-SIL CLARUS™ 6560	Hexamethyldisilazane (HMDZ)	Our under development product for achieving exquisite coating film appearance without compromising anti-sag properties	Contact Cabot	

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.

Performance of our treated silicas in clear acrylic coatings

Sag resistance

Our treated silica rheology modifiers reduce the gravity-driven flow of coatings on vertical surfaces, otherwise known as sag. As shown in figure 1, clear acrylic coatings containing CAB-O-SIL® TS-382, TS-530 or CLARUS 6560 treated silicas all possess very high anti-sag properties.

Film appearance

Film appearance is influenced by several performance attributes such as haze, gloss, orange peel and solvent popping. The right choice of a treated silica additive increases gloss in a coating film while simultaneously reducing haze, orange peel and solvent popping.

- ◆ **Haze:** Haze typically occurs in clear coatings applications when using particulate additives, negatively affecting film appearance. Our treated silica rheology modifiers provide rheology control while lowering the haze. As shown in figure 2, all our products tested exhibited lower haze than the control coating (without our treated silicas).
- ◆ **Gloss:** Gloss is a visual impression resulting from surface evaluation. The greater the reflected direct light, the higher the surface gloss measure. As shown in figure 3, all tested products containing our treated silicas maintained the gloss level of the coating.
- ◆ **Orange peel:** Orange peel is a defect that can be observed on high gloss surfaces as a wavy pattern of light and dark areas. It is measured by visual inspection after curing. Orange peel was almost nonexistent in coatings containing CAB-O-SIL TS-5022 treated silica, and low in coatings containing CAB-O-SIL, CLARUS 6560 and TS-382 treated silicas.

CAB-O-SIL treated silica used in formulation	TS-5022	CLARUS 6560	TS-530	TS-382
Resulting level of orange peel in coating (vs. control)	Significantly lower	Lower	Similar	Lower

- ◆ **Solvent popping:** Popping denotes tiny open blister-like defects that appear in the coating shortly after application. It is measured by visual inspection after curing. Films containing CAB-O-SIL TS-5022 and CLARUS 6560 treated silicas showed minimal popping during testing.

CAB-O-SIL treated silica used in formulation	TS-5022	CLARUS 6560	TS-530	TS-382
Resulting level of solvent popping in coating (vs. control)	Significantly lower	Significantly lower	Lower	Similar

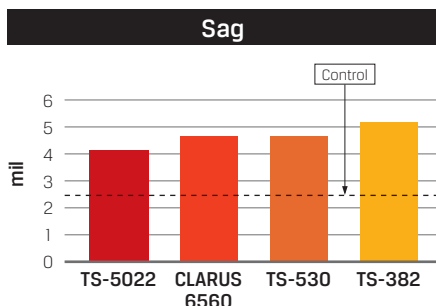


Figure 1: Sag resistance in clear acrylic coatings containing CAB-O-SIL treated silicas

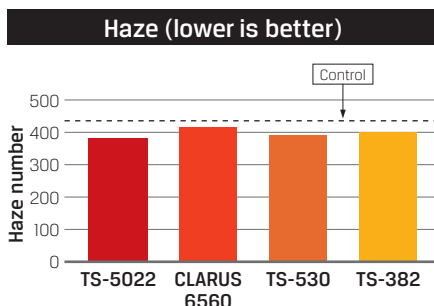


Figure 2: Haze levels in clear acrylic coatings containing CAB-O-SIL treated silicas

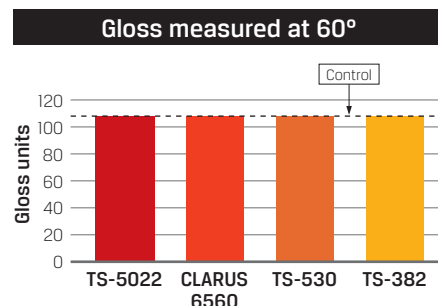


Figure 3: Gloss measurement in clear acrylic coatings containing CAB-O-SIL treated silicas

Performance of our treated silicas in pigmented alkyd coatings

Sag resistance

We measured sag resistance of pigmented alkyd coatings containing our treated silica rheology modifiers.¹ As shown in figure 4, pigmented alkyd coatings containing CAB-O-SIL® TS-382 and TS-530 treated silicas showed excellent anti-sag properties.

Pigment anti-settling

Our rheology modifiers can help prevent the settlement of pigments during production and storage of the paint. All products containing our treated silica showed significantly reduced pigment settling during testing compared to the control (without treated silica). We also found that any pigment that did settle could be easily re-dispersed through simple, low-energy mixing.

CAB-O-SIL treated silica used in formulation	TS-5022	CLARUS™ 6560	TS-530	TS-382
Resulting level of pigment settling in coating	Soft	Soft	Soft	Soft

Film appearance

- ◆ **Haze:** Our treated silica rheology modifiers provide rheology control without adding haze for pigmented industrial and automotive applications, as shown in figure 5.²
- ◆ **Gloss:** As shown in figure 6, select tested products containing our silicas maintained the high gloss level of the coating.³
- ◆ **Orange peel:** Orange peel was almost nonexistent in alkyd coatings containing CAB-O-SIL TS- 5022 and CLARUS 6560 treated silicas during testing.

CAB-O-SIL treated silica used in formulation	TS-5022	CLARUS 6560	TS-530	TS-382
Resulting level of orange peel in coating (vs. control)	Significantly lower	Significantly lower	Lower	Lower

- ◆ **Solvent popping:** Alkyd films containing CAB-O-SIL TS-5022 and CLARUS 6560 treated silicas showed minimal popping in our tests.

CAB-O-SIL treated silica used in formulation	TS-5022	CLARUS 6560	TS-530	TS-382
Resulting level of solvent popping in coating (vs. control)	Significantly lower	Significantly lower	Similar	Lower

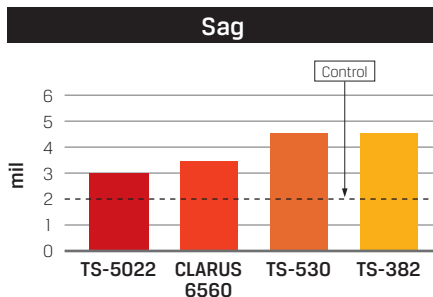


Figure 4: Sag resistance in pigmented alkyd coatings containing CAB-O-SIL treated silicas

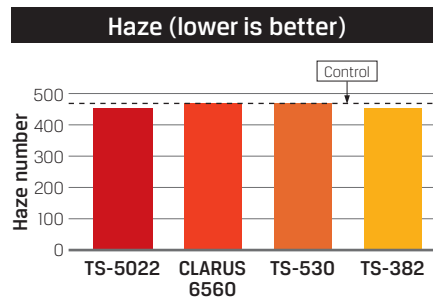


Figure 5: Haze levels in pigmented alkyd coatings containing CAB-O-SIL treated silicas

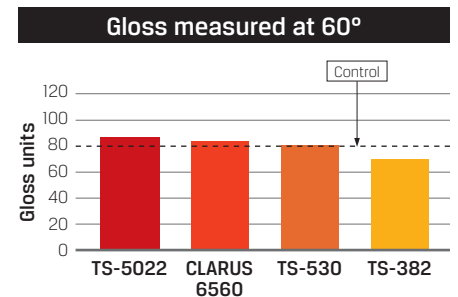


Figure 6: Gloss measurement in pigmented alkyd coatings containing CAB-O-SIL treated silicas

1. For coatings featuring our additives, we measured sag resistance by casting film onto a Leneta® chart using a precision anti-sag meter based on ASTM-D-4400.

2. Haze was measured after cure using a BYK-Gardner Haze-Gloss bench top tester.

3. Gloss was measured after cure using BYK-Gardner Haze-Gloss Micro-Tri-Gloss 20/60/85 degree gloss meter (ASTM D2457).

NORTH AMERICA

Cabot Corporation Business and Technology Center
157 Concord Road
P.O. Box 7001
Billerica, MA 01821 - USA
Technical service
T +1 800 462 2313
Customer service
T +1 678 297 1300
F +1 678 297 1245

SOUTH AMERICA

Cabot Brasil Industria e Comercio Ltda.
Rua do Paraíso 148 - 5 andar
04103-000 Sao Paulo, Brazil
T +55 11 2144 6400
F +55 11 3253 0051

EUROPE

Cabot Specialty Chemicals
Coordination Center
SIA Cabot Latvia
101 Mukusalas Street
Riga, LV-1004, Latvia
T +371 6705 0700
F +371 6705 0985

MIDDLE EAST & AFRICA

Cabot Dubai
P.O. Box 17894
Jebel Ali Free Zone
LOB 15, Office 424
Dubai
United Arab Emirates
T +371 6705 0700
F +371 6705 0985

ASIA PACIFIC

Cabot China Ltd.
558 Shuangbai Road
Shanghai 201108
China
T +86 21 5175 8800
F +86 21 6434 5532

JAPAN

Cabot Specialty Chemicals Inc.
Sumitomo Shiba-Daimon Bldg. 3F
2-5-5 Shiba Daimon,
Minato-ku
Tokyo 105-0012
Japan
T +81 3 6820 0255
F +81 3 5425 4500



cabotcorp.com

© 2018 Cabot Corporation. R02 1/2018

The CAB-O-SIL and CLARUS names are trademarks of Cabot Corporation. The Leneta name is a registered trademark of Leneta Company Inc.

The data and conclusions contained herein are based on work believed to be reliable; however, Cabot cannot and does not guarantee that similar results and/or conclusions will be obtained by others. This information is provided as a convenience and for informational purposes only. No guarantee or warranty as to this information, or any product to which it relates, is given or implied. CABOT DISCLAIMS ALL WARRANTIES EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AS TO (i) SUCH INFORMATION, (ii) ANY PRODUCT OR (iii) INTELLECTUAL PROPERTY INFRINGEMENT. In no event is Cabot responsible for, and Cabot does not accept and hereby disclaims liability for, any damages, whatsoever in connection with the use of or reliance on this information or any product to which it relates.