

# Bringing coatings to life

Performance-engineered precipitated silicas



# Satisfying the evolving demands of the coatings industry



## **Quality, consistency, innovation and manufacturing excellence**

For more than six decades, coating manufacturers have relied on quality precipitated silicas by PPG to advance product performance and appearance or improve manufacturing operations.

From enhancing the efficiency of flattening agents and the sag control of thixotropic silicas to developing environmentally responsible, non-toxic, anti-corrosion pigments, we consistently deliver the innovation and technical expertise needed to satisfy the ever-evolving demands of coatings manufacturers.

Our legacy of quality, reliability and technical prowess continues today. As one of the world's leading manufacturers of precipitated silicas, we supply products specifically engineered for coatings and paints used in industrial, architectural, automotive and specialty applications. Our silicas also perform well in adhesives, sealants and caulks.

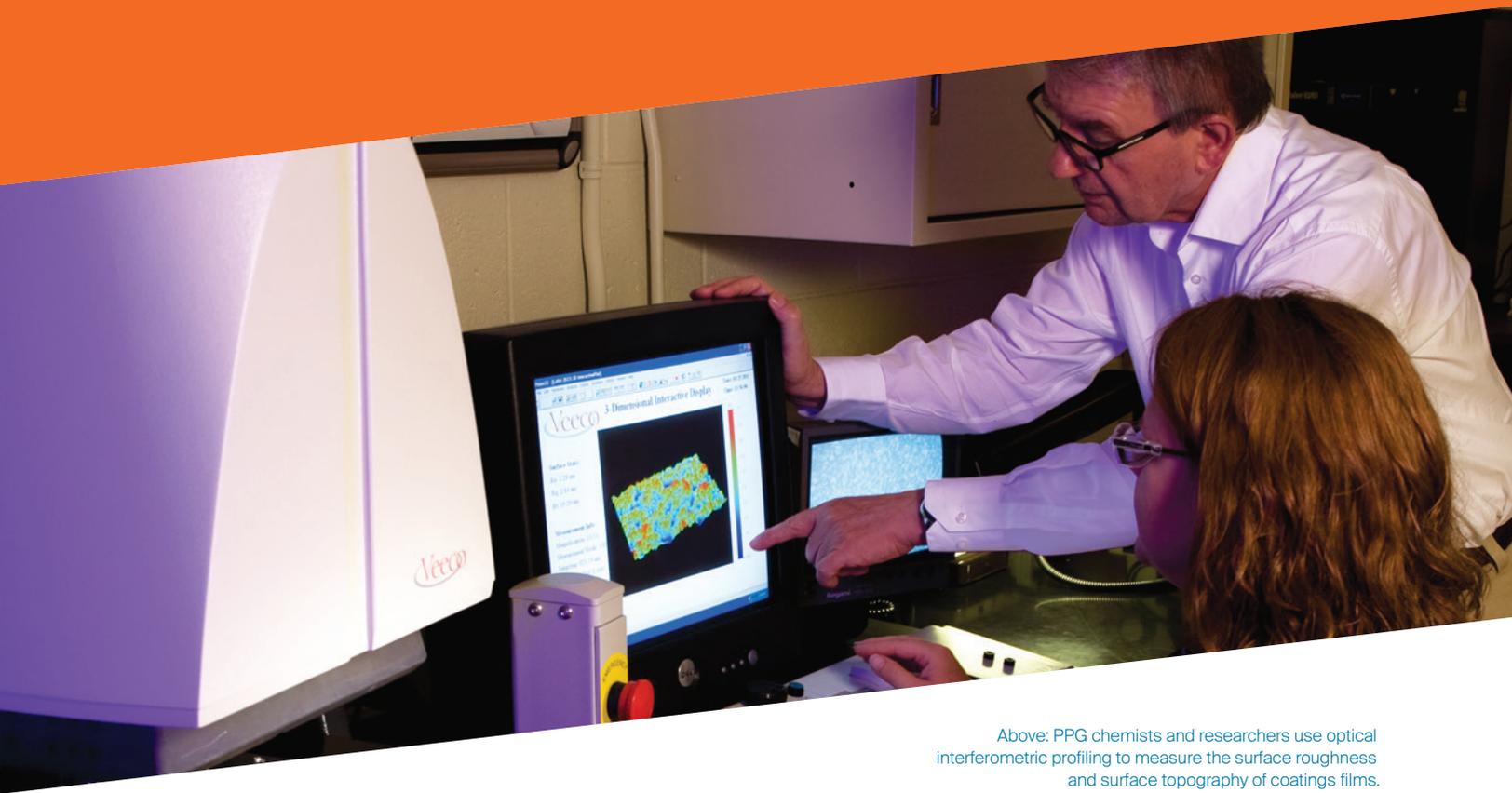
State-of-the-art milling, classification and packaging equipment further expand our ability to meet the product development, manufacturing and environmental compliance requirements of the global coatings industry.

## **Translating performance into benefits**

In the 1930s, PPG became one of the first manufacturers to create synthetic precipitated silicas and bring them to market. Because of our long history with these products, we have developed in-depth knowledge of their functional properties and how they translate into products that meet product formulation challenges.

This experience has enabled us to produce a comprehensive line of high-quality flattening agents, thixotropic agents and anti-corrosion pigments, while sustaining our commitment to creating new products that anticipate the increasingly sophisticated needs of our customers.





Above: PPG chemists and researchers use optical interferometric profiling to measure the surface roughness and surface topography of coatings films.

### Excellence in problem-solving

When you work with PPG, you get more than high-quality silica products engineered for your application. You also gain access to a broad array of product development and problem-solving capabilities.

Our chemists and researchers, based in multiple Technical and Development Centers throughout the Pittsburgh region, use advanced techniques such as microscopy, spectroscopy and surface topographic analysis to evaluate the chemical, optical, mechanical and appearance properties of coating films.

These methods, together with our experienced and knowledgeable technical staff, enable us to develop new silica products specifically for coatings manufacturers. They also give us the ability to partner with customers to diagnose and troubleshoot a broad range of coatings-related problems.

To supplement our analytical, diagnostic and product development capabilities, we operate a pilot plant to test prototype products in a real-world production environment, or to collaborate with customers to resolve manufacturing issues. Because coatings-related production testing and laboratory work often take place at the same facility, we can help accelerate new product development or diagnose production problems to maximize manufacturing efficiencies.

### Global service on a personal scale

At PPG, we see each customer as a valued business partner and are dedicated to providing highly responsive, personalized service through trained and highly skilled representatives. We also maintain a global network of select distributors that enables us to deliver the products and technologies our customers need to enhance product quality and improve manufacturing, no matter the size or scope of their operation.



## LO-VEL® flattening agents

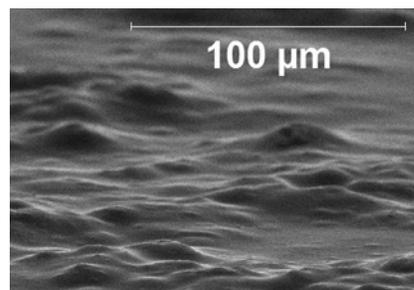
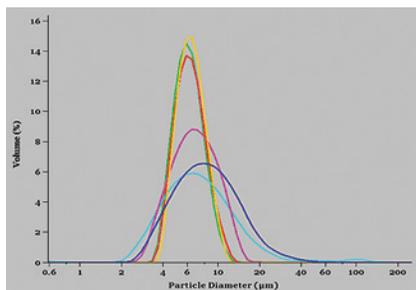
Our LO-VEL® flattening agents are designed to reduce gloss in paints while improving stir-in capability and lowering viscosity. Since debuting in 1968, the *Lo-Vel* product portfolio has expanded to encompass a broad range of highly efficient products that lower manufacturing costs by making coatings easier to apply.

To meet formulator requirements, PPG offers *Lo-Vel* flattening agents with varying degrees of porosity and functional properties. For low-VOC coatings, for example, we manufacture very highly porous precipitated silicas with improved rigidity to withstand the high shear forces generated during paint manufacturing.

Available as wax-treated and non-treated products, *Lo-Vel* flattening agents are suitable for a wide range of coatings film thicknesses. Wax-treated flattening agents improve dispersion stability and anti-settling behavior in mostly polar solvent and waterborne coatings systems. Non-treated flattening agents are recommended mostly for non-polar solvent coatings systems, or for coatings for which greater transparency is critical.

Left: Particle size distributions for *Lo-Vel* flattening silicas are charted by laser light diffractometry.

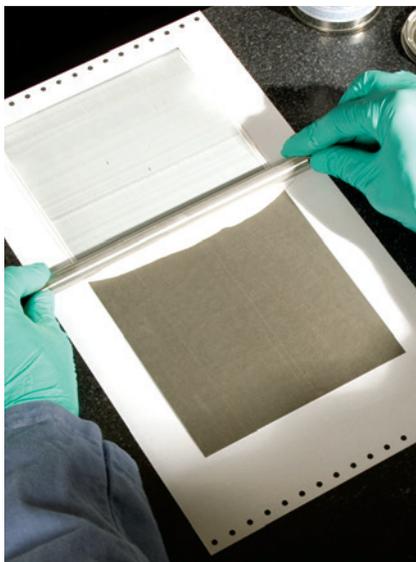
Right: An image from a scanning electron microscope shows the micro-surface roughness of a coatings film.



### Flattening Agents – Non-Treated: Typical Properties

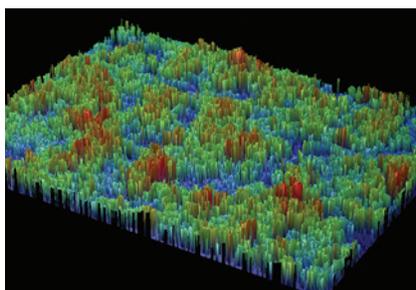
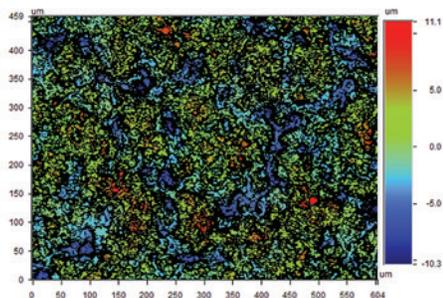
	Particle Size* (µm)	Grind Value		N <sub>2</sub> BET Surface Area (m <sup>2</sup> /g)	DOA-Oil Absorption Number (mL/100g)	Benefits
		Hegman	Fineness (µm)			
<i>Lo-Vel 27</i>	6	6	25	170	230	Smooth finishes, low oil absorption number, easy stir-in (including post-addition).
<i>Lo-Vel 6200</i>	7	6.5	20	700	290	Highest flattening efficiency, high porosity, resistance to overgrind, smooth finishes, stir-in grade.
<i>Lo-Vel 275</i>	8	6	25	175	220	Low oil absorption number, easy stir-in (including post-addition).
<i>Lo-Vel 2003</i>	9	6	25	240	255	High flattening efficiency, resistance to overgrind, stir-in grade.
<i>Lo-Vel 6000</i>	9.5	6	25	720	270	Highest flattening efficiency, high porosity, resistance to overgrind, stir-in grade.
<i>Lo-Vel 2000</i>	10	5.5	32	240	250	High flattening efficiency, resistance to overgrind, stir-in grade.
<i>Lo-Vel 29</i>	10	5	38	170	215	Gives films gloss:sheen ratio near 1:1, low oil absorption number, stir-in grade.
<i>Lo-Vel 39A</i>	11	3.5	57	170	215	Gives films gloss:sheen ratio near 1:1, surface texture, stir-in grade.
<i>Lo-Vel HSF</i>	13	5	38	170	210	High flattening efficiency, gives films gloss:sheen ratio near 1:1, low oil absorption number, surface texture, stir-in grade.

\* Median particle diameter by laser diffraction



Left: A coated panel is prepared for laboratory testing with a wire-wound drawdown bar.

Right: A cone and plate viscometer is used to determine the viscosity of a coatings formulation.



Left: Topographic surface data of a coatings film is displayed in two dimensions by an optical interferometric profiler.

Right: Topographic surface data of a coatings film is displayed interactively in three dimensions by an optical interferometric profiler.

### Flattening Agents – Wax-Treated: Typical Properties

	Particle Size* (µm)	Grind Value		N <sub>2</sub> BET Surface Area (m <sup>2</sup> /g)	DOA-Oil Absorption Number (mL/100g)	Benefits
		Hegman	Fineness (µm)			
Lo-Vel 66	6	6	25	85	195	Smooth finishes, low oil absorption number, excellent coating package stability.
Lo-Vel 8300	6.5	6.5	20	180	230	High flattening efficiency, high transparency in clear waterborne and solvent-borne finishes, excellent settling resistance, smooth finish.
Lo-Vel 8100	8	6.5	20	175	215	High flattening efficiency, low oil absorption number, excellent settling resistance, heat-age stability, and performance consistency.
Lo-Vel 2023	8	6	25	165	235	High flattening efficiency, good resistance to overgrind, low tendency for hard settling.
Lo-Vel 2010	11	5.5	32	175	240	High flattening efficiency, good resistance to overgrind, low tendency for hard settling.
Lo-Vel 2018	12.5	5.5	32	160	265	Gives films a gloss:sheen ratio of near 1:1, resistance to overgrind.

\* Median particle diameter by laser diffraction



## HI-SIL® thickening agents, thixotropes

PPG's technical and product engineering expertise is evident in our industry-leading line of HI-SIL® silica products, developed specifically to improve the formula consistency and sag control of coatings and to accelerate their formula structure recovery. Because of their proprietary performance properties, *Hi-Sil* products enable coatings, adhesives and sealants manufacturers to achieve required performance, application and rheology properties quickly and cost-effectively. They also can replace fumed silicas in some applications.

Vertical and horizontal sag tests show how *Hi-Sil* T-800 thickening agent provides sag control that is superior to fumed silica A in the demonstrated application.



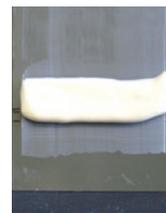
*Hi-Sil* T-800 2 mm



Fumed Silica A 10 mm



*Hi-Sil* T-800 3 mm



Fumed Silica A 8 mm

### Thickeners/Thixotropes: Typical Properties

	Particle Size* (µm)	DOA-Oil Absorption Number (mL/100g)	N <sub>2</sub> BET Surface Area (m <sup>2</sup> /g)	pH	Benefits
<i>Hi-Sil</i> T-800	2.5	270	190	6.9	Superior efficiency in sag control of plastisol-based systems, fast recovery at low shear, cost-effective.
<i>Hi-Sil</i> T-152	4	265	130	6.9	Highly efficient, low-cost, viscosity increase of industrial solvent-based compositions.
<i>Hi-Sil</i> T-700	4	275	190	6.9	Highly efficient, low-cost, improved sag control for a wide variety of solvent-based compositions.
<i>Hi-Sil</i> T-600	5.5	230	150	6.9	Highly efficient, low-cost, thixotropic action for a wide variety of solvent-based compositions.

\* Median particle diameter by laser diffraction



A test incorporating 1,000 hours of salt spray plus the application and removal of pressure tape shows the anti-corrosion performance and adhesive strength of *Inhibisil* 33 (left) compared to anti-corrosion pigment A (right).

## INHIBISIL® anti-corrosion pigments

Suitable for a wide range of primer film thicknesses, our INHIBISIL® anti-corrosion pigments are designed to replace chrome-based and other toxic anti-corrosion pigments, and can be used in both solvent-borne and waterborne primers. In addition to being non-toxic and environmentally friendly, *Inhibisil* products are highly efficient and effective at a competitive cost.



*Inhibisil* 33



Anti-Corrosion Pigment A

### Anti-Corrosion Pigments: Typical Properties

	Particle Size* (µm)	Grind Value		CaO (%)	pH	Benefits
		Hegman	Fineness (µm)			
<i>Inhibisil</i> 33	3	7	12	3	9	Highly effective for thin-film, acid-cured primers, designed for use in solvent- and waterborne systems, heavy metal-free, non-toxic.
<i>Inhibisil</i> 73	3	7	12	7	10	Higher calcium oxide content, elevated protective effectiveness for thin-film primers (solvent- and waterborne), heavy metal-free, non-toxic.
<i>Inhibisil</i> 75	5	6.5	19	7	10	Higher calcium oxide content, elevated protective effectiveness for high-film-build primers (solvent- and waterborne), heavy metal-free, non-toxic.

## PPG silica products by coatings application

	Lo-Vel 27	Lo-Vel 6200	Lo-Vel 275	Lo-Vel 2003	Lo-Vel 6000	Lo-Vel 2000	Lo-Vel 29	Lo-Vel 39A	Lo-Vel HSF	Lo-Vel 66	Lo-Vel 8300	Lo-Vel 8100	Lo-Vel 2023	Lo-Vel 2010	Hi-Sil T-2018	Hi-Sil T-800	Hi-Sil T-152	Hi-Sil T-700	Inhibisil 33	Inhibisil 73	Inhibisil 75
Coil coatings		●	■	■				●													
Industrial coatings		●	■	■	■	■	●	■		●	●	●	●	●							
Decorative paints				●			●	●	●												
Wood coatings	●	●							●	■	■	■		●							
Wood flooring lacquers	●	●						●	■	■	●	●									
Wall paper coatings	●		●			●					●	●	●								
Leather refinishing	●		●	■	●	●				●	●	■									
Leather vinyl refinishing	●	●		■	●	●				■											
UV coatings				■				■						■							
Gel coats																■	●				
Overprint varnishes	■	●							■							●	●				
Printing inks - thin film coatings	■	■								■	●					●	●				
Powder coatings			●														■	●			
Adhesives (plastisol-based)															■	●	●	●			
Sealants															■	●	●	●			
Caulks															●	●	●	●			
Putties															●	●	●	●			
Polyester melamine primer (solvent-borne)																			■	●	●
Polyurethane primer (solvent-borne)																			●	■	■
Epoxy (waterborne)																			●	■	■

■ Preferred    ● Recommended



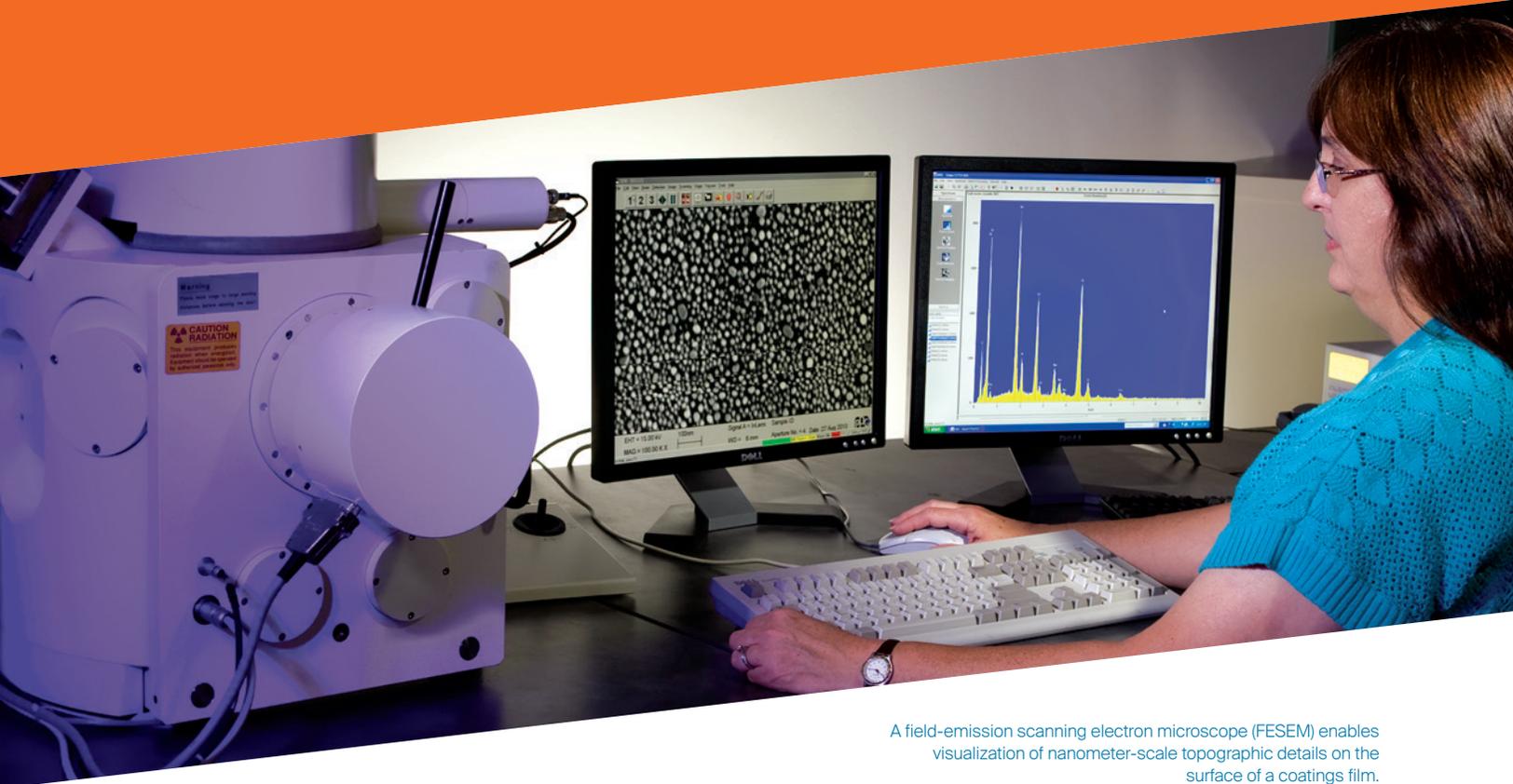
To learn more about about our silica products, please visit [www.ppgsilica.com](http://www.ppgsilica.com)

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A field-emission scanning electron microscope (FESEM) enables visualization of nanometer-scale topographic details on the surface of a coatings film.

### PPG. Innovating solutions.

At PPG, we work every day to develop and deliver the paints, coatings and materials our customers have trusted to protect and beautify their most valuable assets.

Our leadership is based on a legacy of innovation that dates to the founding of our business in 1883 and now encompasses 46,000 employees in 70 countries. With three major research and development centers near our Pittsburgh headquarters and other technical facilities around the world, we invest hundreds of millions of dollars each year to create new and improved products, and to adapt existing technologies to fit the needs of markets and applications.

These development efforts are directed at more than making better products. Environmental sustainability is a driving force behind virtually all PPG research initiatives, whether we are seeking to improve our internal production processes, or to make products that are more energy-efficient or easier to recycle or dispose.

