

# CoatOSil\* 7001

## Silicone-Polyether Block Copolymer



CoatOSil 7001 copolymer is an additive for improved flow and leveling of solventborne two-component acrylic-polyol isocyanate cured coatings.

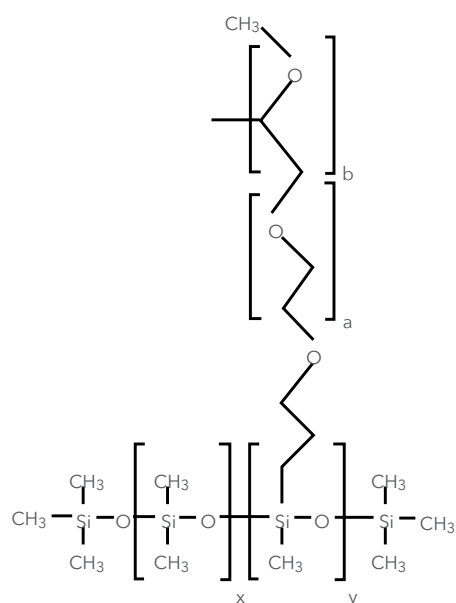
When CoatOSil 7001 copolymer is incorporated as a flow and leveling additive, the appearance and distinctness of image (DOI) of the clearcoat is typically excellent, compared to current commercial additives used in the formulations discussed.

### Key Features and Typical Benefits

Incorporation of 0.05% to 0.10%wt CoatOSil 7001 copolymer into the polyol resin solids portion of a solvent-borne, two-component acrylic polyol clearcoat formulation, cured with a polyisocyanate, can improve the appearance of the final product as viewed by the customer.

- Greater distinctness of image (DOI)
- Improved clarity of final film
- Improved film coalescence
- Reduces long wavelength wavescan values

### Chemical Structure



### Typical Physical Properties

Property	CoatOSil 7001
Density (g/cm <sup>3</sup> ) at 25 °C	1.03
Viscosity at 25 °C, cPoise	1,700
Flash Point, Pensky-Martens (closed cup) ASTM D93 °C (°F)	97 (207)
Liquid Static Surface Tensions at 25 °C (dyne/cm)	(Results on Next Page)

Typical properties are average data and are not to be used as or to develop specifications.

## Typical Physical Properties (continued)

### CoatOSil 7001 copolymer added to various solvents on a wt% basis.

Liquid Surface Tensions		(dyne.cm)		
wt. % CoatOSil 7001	DI Water	PGMEA <sup>(1)</sup>	m-pyrol	Aromatic 100
0.0%	72.3	28.2	41.2	29.1
0.1%	31.1	26.1	23.7	28.0
0.5%	28.4	25.7	22.5	27.3

Solubility studies at 25 °C (0.5%wt CoatOSil 7001 copolymer levels<sup>(a)</sup>) show compatibility/solubility with multiple solvents including:

- Ketones
- Acetates
- Aromatics
- Glycol ethers
- Alcohols
- Water<sup>(a)</sup> ~ 0.1%wt CoatOSil 7001 copolymer loading

## Potential Applications

CoatOSil 7001 silicone-polyether block copolymer is an excellent candidate to consider for use as a flow and leveling additive in acrylic-polyol resin formulations for monocoat and clearcoat formulations. Table 1 shows two sample formulations using two acrylic polyol resins as the primary binder in the polyol portion of the formula.

Table 1: Sample Testing Coating Formulation and Preparation

Grind Paste Preparation:		
Material	Total Added (gms)	Comments
Acrylamac* 232-1375 <sup>(2)</sup>	142.9	Add material under agitation
Fumed Silica <sup>(3)</sup>	20.0	Slowly add fumed silica
n-Butyl Acetate	237.1	Cowles grind for 20 minutes
Add 1.0mm - 1.5mm mill beads to material blend. Grind for additional 30min. Hegman grind gauge will need to indicate a grind of >6.0. If this hasn't been attained, additional grinding time may be required.		
n-Butyl Acetate	75.0	Add as a solvent flush to remove additional paste. (25.26% solids - Theoretical) (Test for % solids) Store for use.
	475.0 gms	

Product formulations are included as illustrative examples only. Momentive makes no representation or warranty of any kind with respect to any such formulations, including, without limitation, concerning the efficacy or safety of any product manufactured using such formulations.

Table 1: Sample Testing Coating Formulation and Preparation (continued)

<b>Coating Formulations:</b>		
Under slow agitation add the following components sequentially:		
	<b>Coatings Formulation #1</b>	<b>Coatings Formulation #2</b>
<b>Material</b>	<b>Total Added (gms)</b>	<b>Total Added (gms)</b>
Grind Paste from above	14.2	11.8
Acrylamac 232-1375	138.6	-
Commercial Acrylic Polyol <sup>(4)</sup>	-	139.3
UVA Light Stabilizer	3.0	3.0
Hindered Amine Stabilizer	1.0	1.0
Tin Catalyst	0.05	0.05
CoatOSil 7001 copolymer	0.10	0.10
n-Butyl Acetate	40.0	40.0
MEK	25.0	25.0
Solvent Reducer <sup>(5)</sup>	144.0	115.0
100% solids HDI trimer <sup>(6)</sup> dissolved in n-Butyl Acetate to 70% wt solids	80.1	73.1

Note: Test results. Actual results may vary.

Product formulations are included as illustrative examples only. Momentive makes no representation or warranty of any kind with respect to any such formulations, including, without limitation, concerning the efficacy or safety of any product manufactured using such formulations.

These formulated viscosities may be sprayed through conventional or HVLP spraygun application.

#### *Spray Application:*

Application was via handspray using DeVilbiss† Starting Line† HVLP touchup gravity spray gun.<sup>(7)</sup>

The substrates used to test CoatOSil 7001 copolymer were smooth electrocoated cold roll steel and flat glass microscope slides. Commercial automotive refinish black basecoat was applied over the smooth electrocoated substrate and the microscope slides, to produce a smooth, thin coating for better analysis of the effects of the CoatOSil 7001 copolymer flow and leveling additive. The prepared basecoat film build was ~ 0.3 to 0.4 mils thick. The clearcoat film builds were prepared to ~2.0 to 2.3 mils thick.

Coatings were applied at ~35 psi wall gauge pressure.

The technique used to spray the coatings was a side-to-side sweep of the spraygun onto the panel at a rate of ~1,000 ipm. The gun to target distance was ~12 inches. The gun orifice was 1mm at the full open position.

Both the basecoat and the clearcoat were applied using the same spraygun. Ensure appropriate cleaning of the guns when switching between coating systems.

#### *Panel Cure:*

After spray application, air flash coating under ambient conditions for 10 to 15 minutes horizontally and vertically (optional). After the air flash, the coating systems may be placed in an oven between 140°F to 180°F for 30 minutes, to accelerate topcoat cure. When the samples have fully cured, sample testing may begin.

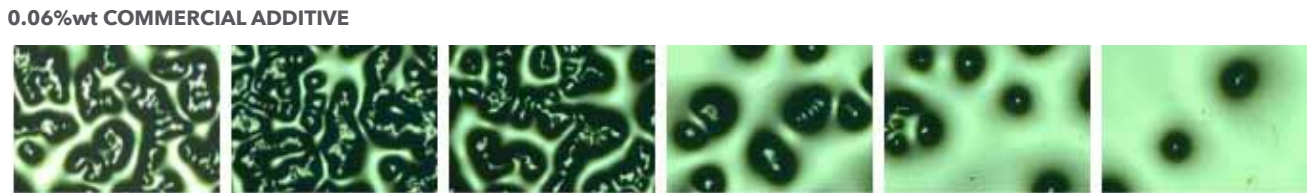
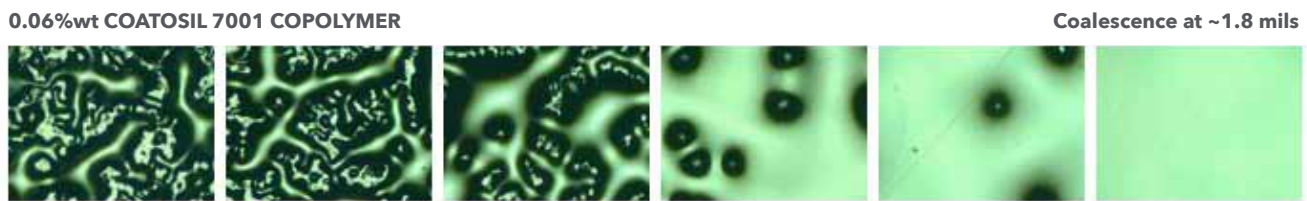
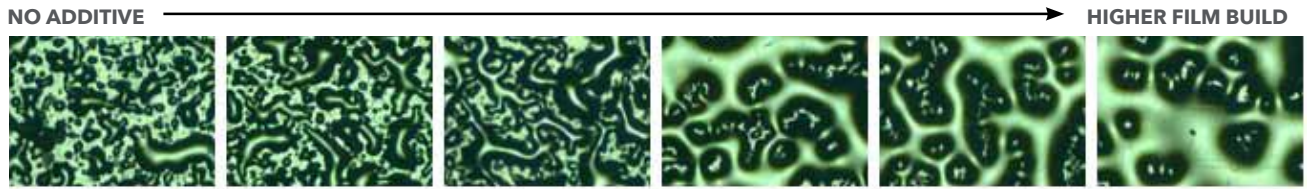
#### *Sample Testing:*

Flow and leveling was tested using a "Chrysler C-Box" visual rating system and with a Wave-Scan *Dual* Instrument.<sup>(8)</sup>

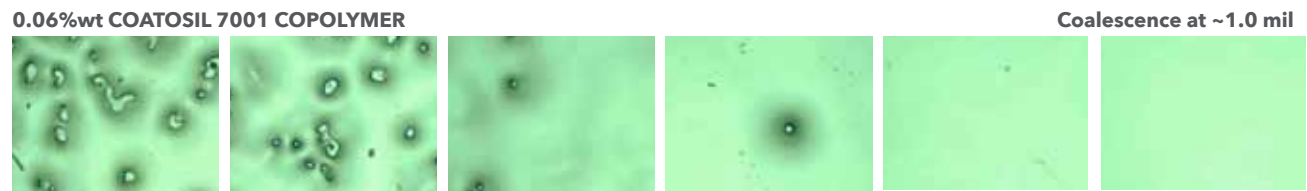
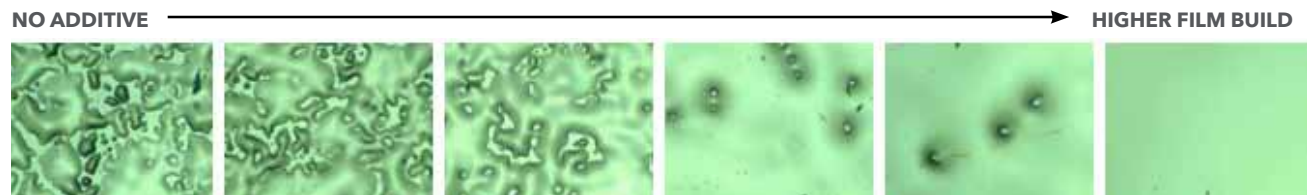
The coatings on the glass slides were observed under a microscope at low power to determine flow and leveling effects.

Performance Application Data

Clearcoat samples of **Formulation #1** were spray applied as a film build gradient over black basecoated glass substrate to evaluate the coalescence, flow and leveling performance on very smooth surfaces. The three samples tested were: 0.00%wt additive, 0.06%wt CoatOSil 7001 copolymer, and 0.06%wt of a commercially available flow additive, based on a 100 gram total resin solids basis.



Additionally, these clearcoat samples were applied directly over the glass substrate to evaluate flow and leveling over a distinctly different substrate.

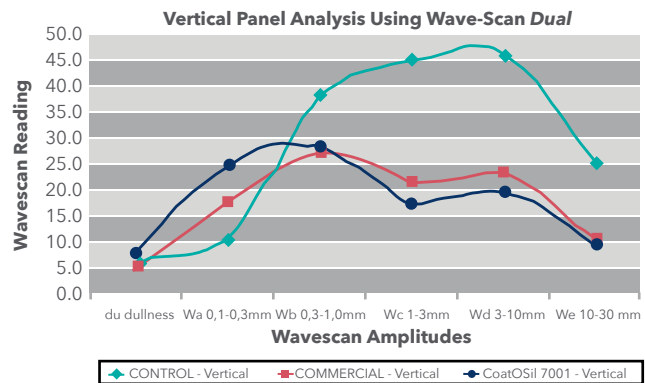
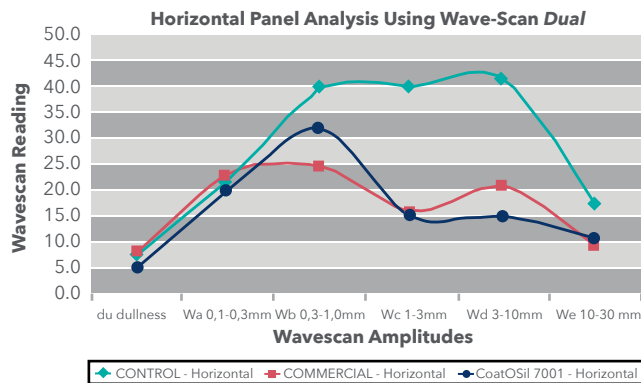
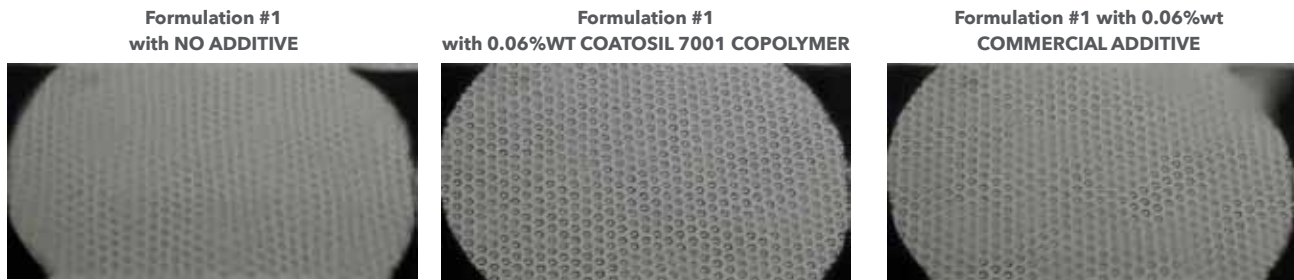


Note: Test results. Actual results may vary.

Performance Application Data (continued)

Clearcoat coating **Formulations #1 and #2** were also prepared over a smooth electrocoated substrate and coated with black basecoat. The Chrysler C-Box and Wave-Scan *Dual* results are shown for the following systems: No additive, 0.06%wt CoatOSil 7001 copolymer, and 0.06%wt of a Commercial control on a 100gram resin solids basis. Clearcoat film builds were in the ~2.0 to 2.3mil film thickness range for all topcoats.

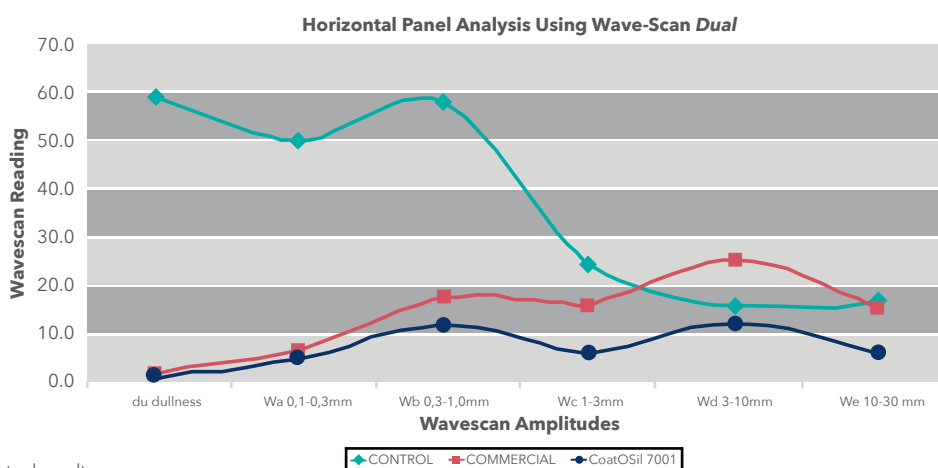
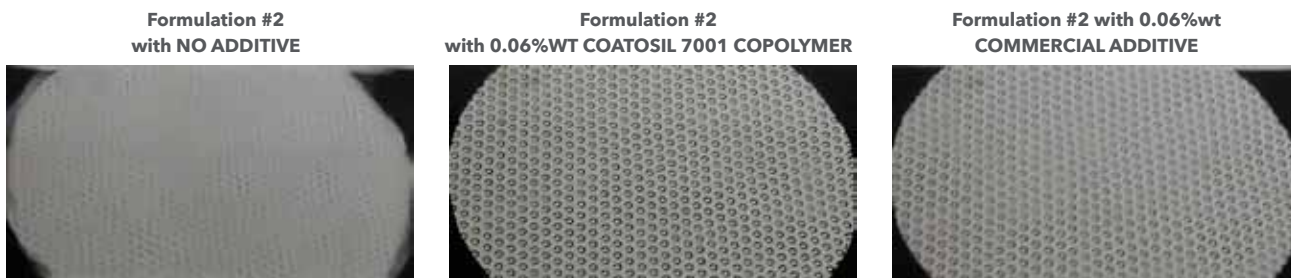
Horizontal Panel Evaluations Using COATING FORMULATION #1



Note: Test results. Actual results may vary.

## Performance Application Data (continued)

## Horizontal Panel Evaluations Using COATING FORMULATION #2



Note: Test results. Actual results may vary.

## Conclusions

CoatOSil 7001 copolymer provided improved flow and leveling properties in the clearcoat formulations tested when compared to a commercially available flow and leveling additive and a control formulation with no additive. These flow and leveling improvements were quantified in formulations using two distinct acrylic-polyol binder resin systems. Application is not limited to these two types of acrylic-polyols and may be considered for use in a wider formulation array of acrylic-polyol resins and blends. Hydroxy functional polymers and amine functional polymers, compatible with main acrylic-polyol binders would also be excellent candidate resins to consider for formulations with specific performance requirements, along with flow and leveling properties provided by CoatOSil 7001 copolymer.

An initial starting point for incorporating CoatOSil 7001 copolymer into coating formulations would be ~0.06%wt on 100 grams Total Resin Binder (Polyol + Polyisocyanate) Solids or ~0.10%wt on 100 grams resin solids basis on polyol portion.

## References

1. PGMEA is Propylene Glycol Methyl Ether Acetate
2. Acrylamac\* 232-1375, available through MOMENTIVE
3. Treated fumed silica having BET surface area  $\sim 250 \pm 40 \text{ m}^2/\text{g}$  and 1.5% to 3.5% wt carbon content
4. Commercial acrylic polyol ( $\sim 460 \text{ OH equiv. wt at } 100\% \text{ solids}$ , supplied at 70% wt solids)
5. Fast to medium solvent evaporation rates using acetates, ketones, aromatic and aliphatic blends
6. Aliphatic polyisocyanate HDI trimer
7. Devilbiss† and Starting Line† are registered trademarks of Illinois Tool Works, Inc.
8. Wave-Scan *Dual* Instrument available through Byk-Gardner USA

## Patent Status

Nothing contained herein shall be construed to imply the nonexistence of any relevant patents or to constitute the permission, inducement or recommendation to practice any invention covered by any patent, without authority from the owner of the patent.

## Limitations

Customers must evaluate Momentive Performance Materials products and make their own determination as to fitness of use in their particular applications.

## Product Safety, Handling and Storage

Customers should review the latest Safety Data Sheet (SDS) and label for product safety information, safe handling instructions, personal protective equipment if necessary, emergency service contact information, and any special storage conditions required for safety. Momentive Performance Materials (MPM) maintains an around-the-clock emergency service for its products. SDS are available at [www.momentive.com](http://www.momentive.com) or, upon request, from any MPM representative.

For product storage and handling procedures to maintain the product quality within our stated specifications, please review Certificates of Analysis, which are available in the Order Center. Use of other materials in conjunction with MPM products (for example, primers) may require additional precautions. Please review and follow the safety information provided by the manufacturer of such other materials.

## Customer Service Centers

**Worldwide**

Email: commercial.services@momentive.com

**Americas**+1 800 295 2392  
+1 614 986 2495**Europe, Middle East,  
Africa and India**00800 4321 1000  
+40 213 044229**Asia Pacific****China**  
800 820 0202  
+86 21 3860 4892**Japan**0120 975 400  
+81 276 20 6182**All Other Countries**  
+60 3 9206 1543

## Disclaimer

FORMULATIONS ARE ILLUSTRATIVE EXAMPLES AND DO NOT REPRESENT COMMERCIALIZED PRODUCTS. They have not been subjected to extensive testing and Momentive makes no representation or warranty of any kind with regard to any such formulations, including, without limitation, concerning the performance, efficacy or safety of any product manufactured using such formulations. EACH USER BEARS FULL RESPONSIBILITY FOR (1) MAKING ITS OWN DETERMINATION AS TO THE SUITABILITY AND LEGAL COMPLIANCE OF ANY FORMULATION, MATERIALS, RECOMMENDATIONS, OR ADVICE FOR ITS OWN PARTICULAR USE, (2) IDENTIFYING AND PERFORMING ALL TESTS AND ANALYSES NECESSARY TO ASSURE THAT ITS FINISHED PRODUCTS BASED UPON EXAMPLE FORMULATIONS AND/OR INCORPORATING MENTIONED PRODUCTS, MATERIALS, OR SERVICES WILL BE SAFE AND SUITABLE FOR USE UNDER END-USE CONDITIONS, AND (3) OBTAINING ANY NECESSARY GOVERNMENT OR REGULATORY CLEARANCE, LICENSE OR REGISTRATION.

Any reference to a third party's materials is not an endorsement of those materials or an endorsement by the third party of Momentive materials. Momentive has not undertaken a comprehensive patent or other intellectual property search on the formulations. No statement contained herein concerning a possible or suggested use of any material, product, service or design is intended, or should be construed, to grant any license under any patent or other intellectual property right covering such use or design, or as a recommendation for the use of such material, product, service or design in the infringement of any patent or other intellectual property right.

BEFORE HANDLING ANY PRODUCTS MENTIONED, REVIEW THE LATEST SAFETY DATA SHEET (SDS) AND LABEL FOR PRODUCT SAFETY INFORMATION, SAFE HANDLING INSTRUCTIONS, PERSONAL PROTECTIVE EQUIPMENT IF NECESSARY, EMERGENCY SERVICE CONTACT INFORMATION, AND ANY SPECIAL STORAGE CONDITIONS REQUIRED FOR SAFETY. MOMENTIVE MAINTAINS AN AROUND-THE-CLOCK EMERGENCY SERVICE FOR ITS PRODUCTS. SDS FOR MOMENTIVE PRODUCTS ARE AVAILABLE AT WWW.MOMENTIVE.COM OR, UPON REQUEST, FROM ANY MOMENTIVE REPRESENTATIVE. USE OF OTHER MATERIALS IN CONJUNCTION WITH MOMENTIVE PRODUCTS MAY REQUIRE ADDITIONAL PRECAUTIONS. PLEASE REVIEW AND FOLLOW THE SAFETY INFORMATION PROVIDED BY THE MANUFACTURER OF SUCH OTHER MATERIALS.

THE MATERIALS, PRODUCTS AND SERVICES OF MOMENTIVE PERFORMANCE MATERIALS INC. AND ITS SUBSIDIARIES AND AFFILIATES (COLLECTIVELY "SUPPLIER"), ARE SOLD SUBJECT TO SUPPLIER'S STANDARD CONDITIONS OF SALE, WHICH ARE INCLUDED IN THE APPLICABLE DISTRIBUTOR OR OTHER SALES AGREEMENT, PRINTED ON THE BACK OF ORDER ACKNOWLEDGMENTS AND INVOICES, AND AVAILABLE UPON REQUEST. EXCEPT AS PROVIDED IN SUPPLIER'S STANDARD CONDITIONS OF SALE, SUPPLIER AND ITS REPRESENTATIVES SHALL IN NO EVENT BE RESPONSIBLE FOR ANY LOSS RESULTING FROM ANY USE OF ITS MATERIALS, PRODUCTS OR SERVICES DESCRIBED HEREIN. Nothing in this or any other document, nor any oral recommendation or advice, shall be deemed to alter, vary, supersede, or waive any provision of Supplier's standard Conditions of Sale or this Disclaimer, unless any such modification is specifically agreed to in a writing signed by Supplier.