

Dow Corning[®] **MB50-001** **Masterbatch**

FEATURES & BENEFITS

- Imparts processing improvements and modified surface characteristics
- Improved throughput
- Reduced energy consumption
- Enhanced scratch resistance
- Improved slip properties
- Decreased coefficient of friction
- Enhanced long term and stable efficiency vs. traditional processing aids and lubricants

COMPOSITION

- Free flowing solid pellets

Ultra-high molecular weight siloxane polymer, dispersed in polypropylene homopolymer

APPLICATIONS

- Additive in polypropylene compatible systems.

TYPICAL PROPERTIES

Specification Writers: These values are not intended for use in preparing specifications. Please contact your local Dow Corning sales office or your Global Dow Corning Connection before writing specifications on this product.

| Property | Unit | Result |
|---------------------|-------------|---------------------|
| Appearance | | Off-white pellets |
| Siloxane content | % | 50 |
| Organic resin | | Polypropylene MI 12 |
| Suggested use level | % | 0.2 to 10 |

DESCRIPTION

Dow Corning[®] MB50-001 Masterbatch is a pelletized formulation containing 50% of an ultra-high molecular weight (UHMW) siloxane polymer. It is designed to be used as additive in polypropylene compatible systems to impart benefits such as processing improvements and modification of surface characteristics.

Liquid siloxane plastic additives have been used for several years to improve the lubricity and flow of thermoplastics. They are effective in this role, although until now some difficulties have been experienced in the incorporation of liquids into thermoplastic melts without use of specialized equipment. It has also been difficult to produce masterbatches with greater than 20% liquid siloxane because of processing difficulty and bleed problems.

The *Dow Corning*[®] MB Series Masterbatches address these problems by supplying a high concentration of an ultra-high molecular weight (UHMW) siloxane as dispersion in a dry pellet form in a variety of thermoplastics.

BENEFITS

When added to polypropylene or similar thermoplastics at 0.2% to 2.0%, improved processing and flow of the resin is expected, including better mold filling, less extruder torque, internal lubrication, mold release and faster throughput. At higher addition levels, 2% to 10% improved surface properties are expected, including lubricity, slip, lower coefficient of friction, and greater scratch, mar and abrasion resistance. A study evaluating paintability showed no adverse effects in polypropylene with up to 5% ultra-

high molecular weight siloxane added, as demonstrated in Table 2.

The *Dow Corning* MB Series Masterbatches are expected to give improved benefits compared to conventional lower molecular weight siloxane additives, e.g., less screw slippage, improved release, a lower coefficient of friction, fewer paint and printing problems, and a broader range of performance capabilities. Figure 1 shows a significant effect on coefficient of friction values.

Figure 1: Coefficient of friction vs. rotational velocity (PP)

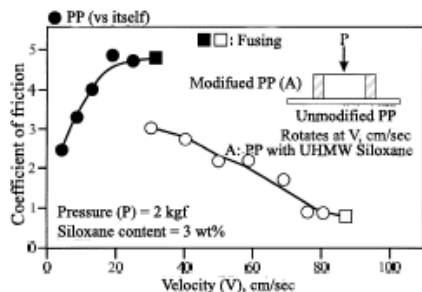
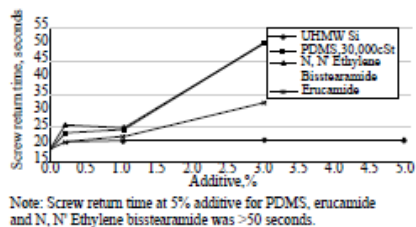


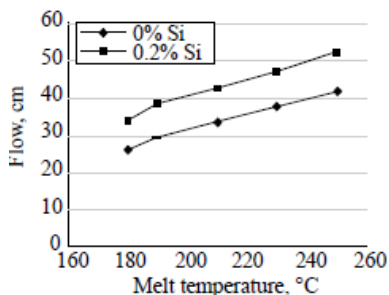
Figure 2 demonstrates the effect of UHMW siloxane, organic slip additives and low viscosity polydimethylsiloxane (PDMS) on screw slippage. Use of UHMW siloxane additive provides a constant screw return time, indicating little or no screw slippage. In comparison, the two organic slip additives and low viscosity PDMS used, show an increase in screw return time, indicating slippage caused by the additives, which can affect process cycle time.

Figure 2: Injection molding screw slippage.



In a standard injection molding spiral mold flow test, a 0.2% UHMW siloxane additive increases flow length by approximately 30% at a given temperature. Additionally, the siloxane additive will yield the same flow at approximately 50°C (122°F) lower melt temperature than without the additive. See Figure 3.

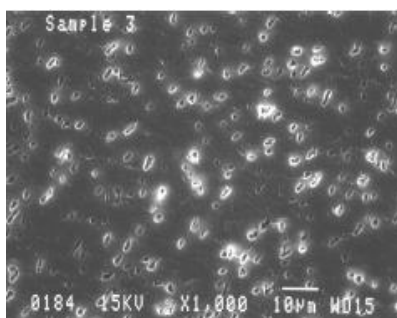
Figure 3: Spiral mold flow.



A study of homopolymer polypropylene with up to 5% UHMW siloxane shows good printability compared to a common organic (erucamide) slip additive. See Figure 6.

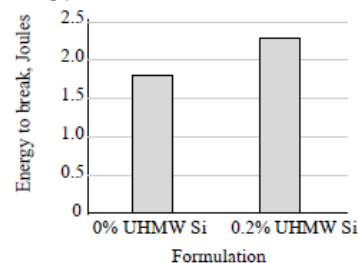
The scanning electron micrograph in Figure 4 shows the siloxane dispersion in a polypropylene matrix.

Figure 4: Scanning electron micrograph.



In a test measuring the energy to break of a double gated tensile bar containing 0% and 0.2% UHMW siloxane, the siloxane additive increased the weld-line strength by 27%. See Figure 5.

Figure 5: Weld line strength of TPO.



FOOD CONTACT

Dow Corning MB50-001 Masterbatch is suitable for use as a slip or release agent in the production of the basic polymer or finished food contact article in compliance with US FDA regulation 21 CFR 177.1520. The olefin polymer portion of *Dow Corning* MB50001 Masterbatch complies with 177.1520(c) 1.1 and the siloxane portion complies with 181.28.

This product may comply with European requirements concerning its use in contact with foodstuffs. The specific regulation(s) this product is compliant with are stated in the 'Food Regulatory Profile'. This document is available from your local *Dow Corning* representative.

HOW TO USE

Dow Corning MB Series Masterbatches may be processed in the same way as the thermoplastics on which they are based. Sufficient *Dow Corning* MB50-001 Masterbatch should be blended with virgin polymer pellets to give the desired siloxane level in the final product. *Dow Corning* MB50-001 Masterbatch pellets can be added during compounding in a single screw extruder or added at the feed hopper during injection molding or extrusion.

HANDLING PRECAUTIONS PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND SAFETY DATA SHEETS

AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE SAFETY DATA SHEET IS AVAILABLE ON THE DOW CORNING WEBSITE AT DOWCORNING.COM, OR FROM YOUR DOW CORNING SALES APPLICATION ENGINEER, OR DISTRIBUTOR, OR BY CALLING DOW CORNING CUSTOMER SERVICE.

USABLE LIFE AND STORAGE

When stored at or below 35°C (95°F) in the original unopened containers *Dow Corning* MB50-001 Masterbatch has a usable life of 48 months from the date of production.

PACKAGING INFORMATION

This product is available in a variety of container sizes. Contact your local Dow Corning sales representative for information about container sizes available in your area.

LIMITATIONS

This product is neither tested nor represented as suitable for medical or pharmaceutical uses.

HEALTH AND ENVIRONMENTAL INFORMATION

To support customers in their product safety needs, Dow Corning has an extensive Product Stewardship organization and a team of Product Safety and Regulatory Compliance (PS&RC) specialists available in each area.

For further information, please see our website, dowcorning.com or consult your local Dow Corning representative.

LIMITED WARRANTY INFORMATION – PLEASE READ CAREFULLY

The information contained herein is offered in good faith and is believed to

be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that our products are safe, effective, and fully satisfactory for the intended end use. Suggestions of use shall not be taken as inducements to infringe any patent.

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Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, DOW CORNING SPECIFICALLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY.

DOW CORNING DISCLAIMS LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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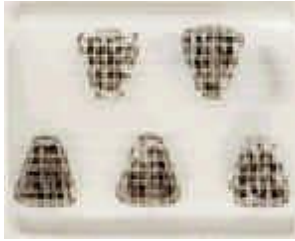
dowcorning.com

Figure 6: Printability study-3M tape 250 as molded.

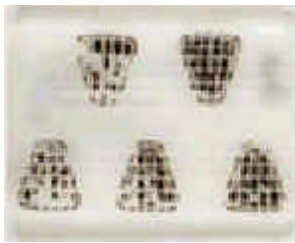
100% Amoco 3243 PP



0.2% UHMW Si



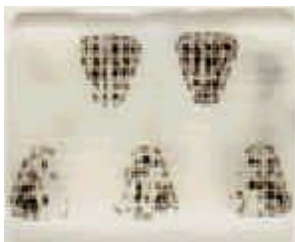
1% UHMW Si



3% UHMW Si



5% UHMW Si



0.2% Erucamide



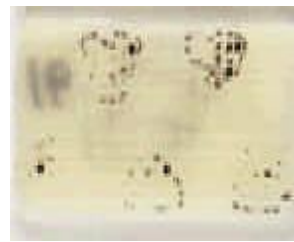
1% Erucamide



3% Erucamide



5% Erucamide



Note: Results will vary depending on materials, processing, post processing, and testing conditions. Data is to be used as an indicator of the potential effect of UHMW siloxane on the printability of PP.

Table 1: Physical properties of polypropylene modified with an ultra-high molecular weight polydimethylsiloxane additive.

| Property | Siloxane content % | | |
|---------------------------|--------------------|------|------|
| | 0 | 0.1 | 5.0 |
| Tensile strength, MPa | 39 | 37 | 33 |
| Elongation, % | 36 | 70 | 220 |
| Modulus, MPa | 1751 | 1884 | 1646 |
| Izod, notch, J/m | 15 | 21 | 29 |
| Melt flow, g/10 minutes | 13.3 | 13.6 | 13.7 |
| Vicat softening, C | 157 | 155 | 153 |
| Taber abrasion, mg loss 0 | 16.2 | 14.4 | 12.0 |
| Coefficient of friction, | | | |
| Static | 0.25 | 0.24 | 0.15 |
| Kinetic | 0.17 | 0.14 | 0.10 |

Table 2: Effect of siloxane on paintability.

| ID | Formulation | Adhesion rating | |
|------|-----------------------------|-----------------|----------|
| | | Method A | Method B |
| 1-1 | 100% polypropylene (PP) | 2A | 3B |
| 1-1 | 100% polypropylene (PP) | 2A | 3B |
| 5-10 | 99.5% PP/0.5% UHMW siloxane | 2A | 3B |
| 5-9 | 99.5% PP/0.5% UHMW siloxane | 3A | 4B |
| 6-12 | 97% PP/3% UHMW siloxane | 4A | 4B |
| 6-11 | 97% PP/3% UHMW siloxane | 4A | 4B |
| 7-13 | 95% PP/5% UHMW siloxane | 4A | 4B |
| 7-14 | 95% PP/5% UHMW siloxane | 4A | 5B |

Testing was performed by an outside test facility: ACT Laboratories, Inc.; top coat was Red Spot AE267 Blue (interior primerless PP lacquer) after powerwash. Relevant specifications: Ford WSBM15J7A, GM GM4350N Class C/0, Chrysler MS PP96. Testing performed per ASTM D 3359.

Results will vary depending on materials, processing, post-processing, and testing conditions.