

Specialty Rheology Modifiers for Concentrated Liquid Detergent Products

AEROSIL®



Consumers are attracted to detergents that leave their clothes clean and stain-free, maintain the integrity of their clothing and that are highly dispersible, for a more efficient clean. Since consumers are looking for premium and concentrated detergents with multi-functional benefits that target their specific needs, Evonik has developed the perfect solution for liquid detergent formulators.

Evonik's wide range of AEROSIL® fumed silica grades improve product form and appeal by offering targeted rheology control. These specialty ingredients control viscosity and suspension properties independently, which gives the formulator a high degree of flexibility. Formulations thickened or stabilized with AEROSIL® also have outstanding pourability driven by the thixotropic or shear-thinning nature of these thickeners.

Low-water detergent test formulation

| Material | Weight percentage |
|--------------------------------------------------|-------------------|
| Tomadol® 91-8 | 19 % |
| BIO-SOFT® S 101 (<i>neutralized</i>) | 38.63 % |
| 30 % Sodium Citrate Solution (<i>in water</i>) | 36.75 % |
| Propylene Glycol | 5.52 % |
| Select AEROSIL® grade | 0%–3 % |

Viscosity effect of AEROSIL® grades on detergent test formulation

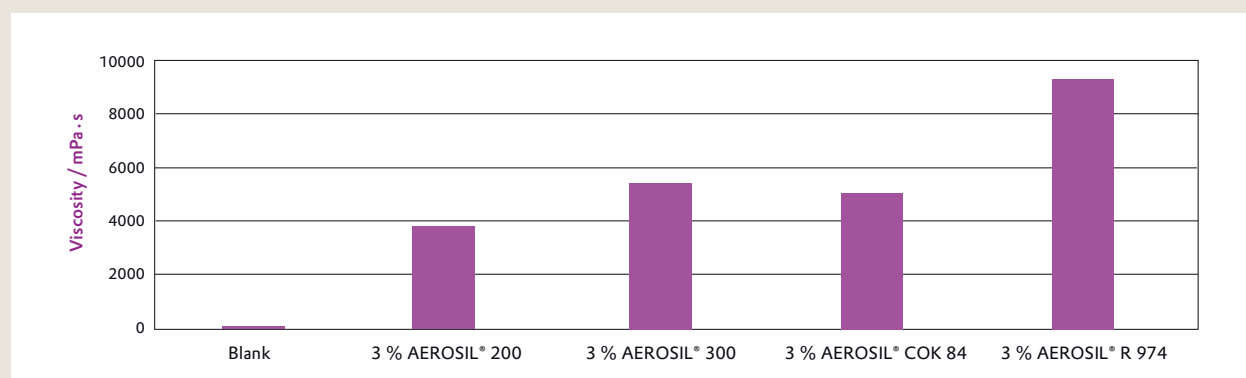
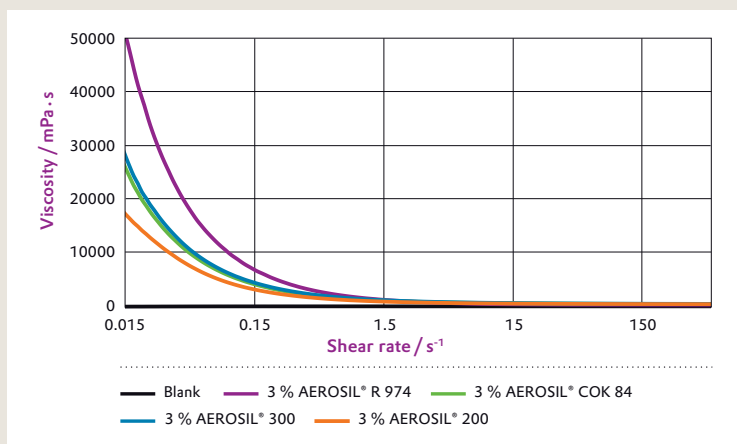


Figure 1 Viscosity of the test formulation with 3 % of the AEROSIL® grades at a shear rate of 0.102 s^{-1} , measured on an Anton Paar MCR 302

Rheological curves showing shear-thinning behavior of test formulation



- Hydrophobic silica such as AEROSIL® R 974 achieves a high level of thickening efficiency.
- Hydrophilic silica like AEROSIL® 300 and 200 offers a balance between thickening and suspension properties.
- All silica grades show a desired shear-thinning profile for improved pourability.

Figure 2 Shear rate vs. viscosity for the test formulation with 3% of the AEROSIL® grades, measured on an Anton Paar MCR 302

Wide range of AEROSIL® chemistries are available based on your formulation needs

| AEROSIL® 200 AEROSIL® COK 84 | AEROSIL® R 816 | AEROSIL® R 974 | AEROSIL® R 202 AEROSIL® R 208 | AEROSIL® R 812 AEROSIL® R 812 S |
|---------------------------------|----------------------------|------------------------|----------------------------------|------------------------------------|
| | | | | |
| No surface treatment | Hexadecyl-trimethoxysilane | Dimethyldichlorosilane | Polysiloxane | Hexamethyldisilazane |

More hydrophilic grades

More hydrophobic grades

AEROSIL® can be a powerful formulation aid that:

- Prevents suspended particles from settling.
- Improves filling efficiency of unit dose packs.
- Has compatibility and synergies with surfactant systems.
- Stabilizes highly acidic formulations.
- Delivers a desired shear-thinning profile for improved pourability.

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