DOW COATING MATERIALS

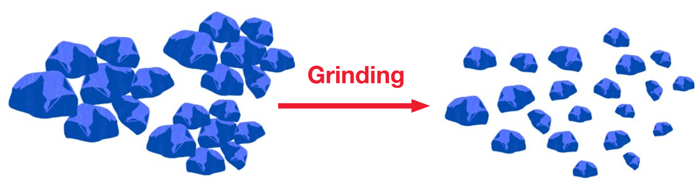
# TAMOL™ dispersants

Product solutions guide

## Getting more from your paint

The goal of the dispersion phase in the paint making process is to mechanically separate pigment particles by high shear and stabilize these pigment particles for optimum performance. Properly dispersing and stabilizing pigment particles will help improve the light scattering for higher hiding and a tighter, more durable coating. If not properly stabilized, the pigment particles in dispersion will re-agglomerate over time and thus provide lower gloss, poor hiding and reduced durability.

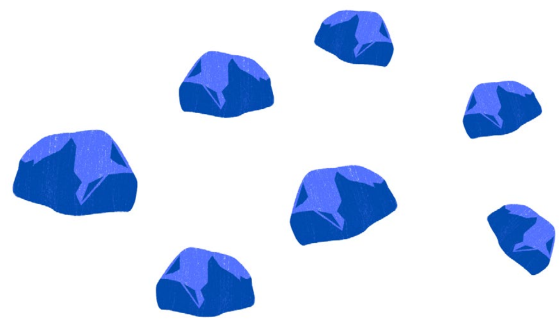
**The mechanical breakup and separation (deagglomeration) of pigment clusters to isolated primary particles.**




As-supplied pigment is agglomerated

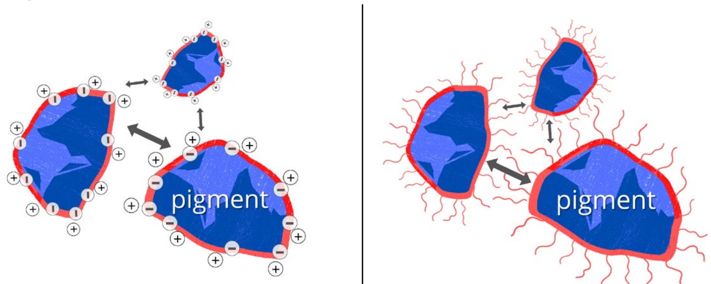
Grinding reduces agglomeration

**TAMOL™ dispersants keep particles separated over time.**



Dispersant molecules play an active role in this phase. The role of a dispersant molecule is to prevent re-agglomeration of dispersed pigment particles over time; this is key to developing a high-performance, durable coating for any surface you want to protect.

**Figure 1.**




**Electrostatic Stabilization**
Coulombic stabilization or charge-charge repulsion

**Steric Stabilization**
Dispersion via excluded volume

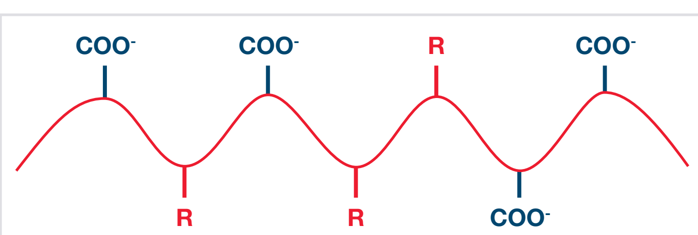
## Stabilization Mechanism

Dispersants provide stabilization of pigment particles by two different mechanisms: electrostatic or steric stabilization, as shown in Figure 1. Electrostatic stabilization depends on the ionic charges on the pigment particle surfaces, creating repulsive force between the particles. Steric stabilization relies on the steric hindrance from polymer chains on pigment particle surfaces, which make it thermodynamically unfavorable for such pigment particles to get closer due to the reduction in entropy. A combination of both electrostatic and steric stabilization mechanism is called electrosteric stabilization, which often provides more universal application and better overall performance.

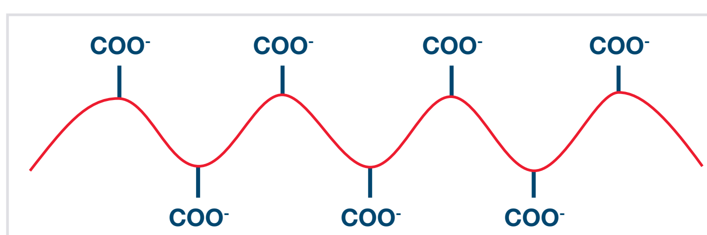
## Dispersant Chemistry

Dow offers several different types of dispersants for waterborne coatings application: polyacid, hydrophilic copolymer, hydrophobic copolymer, and polymeric dispersants. The category of dispersant chosen depends on pigment type, dispersing efficiency, rheology modifier compatibility, ZnO compatibility, and dry film performance requirements for a particular formulation.

**Acrylic or Polycarboxylate Copolymer**

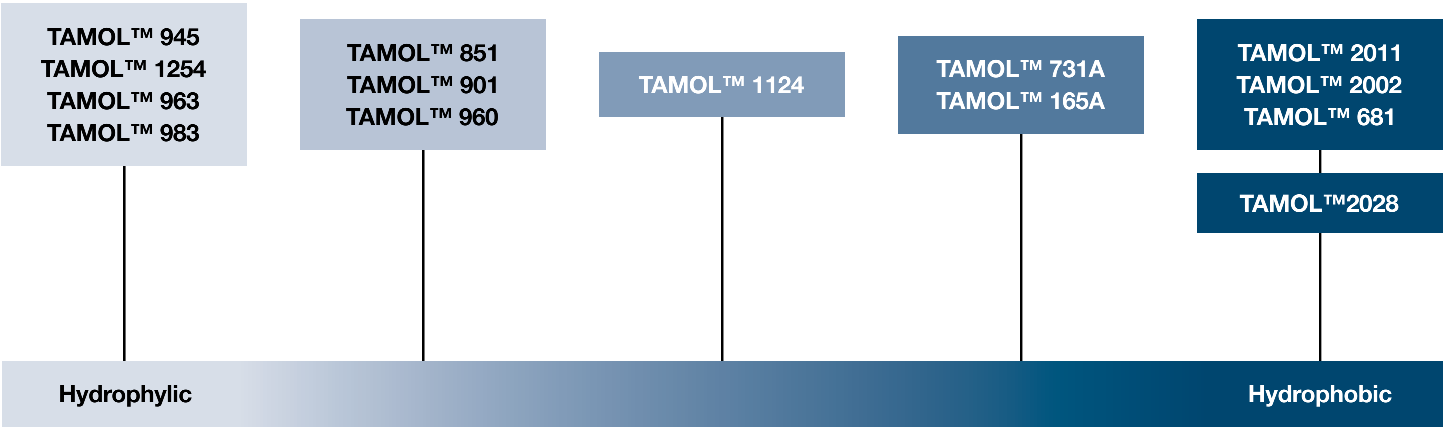



**Polyacid Dispersant**




- Hydrophilic copolymer
- Hydrophobic copolymer

**The TAMOL™ family of dispersants includes both the polyacid and acrylic or polycarboxylate copolymer types.**




## Polyacid dispersants

Polyacid dispersants are made by polymerizing acrylic, methacrylic, crotonic, or maleic acids together. They are typically supplied in the neutralized form using either ammonium or alkali metal salts. Polyacid dispersants are efficient and cost effective for inorganic pigments dispersion, but not always the best choice for facilitating overall paint performance. Polyacid dispersants are best paired with ASE, HASE, and cellulose ether rheology modifiers.

## Acrylic or Polycarboxylate copolymer dispersants

Acrylic or polycarboxylate copolymers contain hydrophilic or hydrophobic comonomers. These copolymer dispersants are typically supplied in the neutralized form using either ammonium or alkali metal salts. Hydrophilic copolymers are recommended with the use of HASE/HEUR rheology modifier packages. Hydrophilic copolymers are the most versatile dispersants and balance efficiency and broad compatibility. Hydrophobic copolymer dispersants are commonly recommended with HEUR rheology modifier packages. Hydrophobic copolymer dispersants sacrifice dispersant efficiency, but can impart other film properties such as improved gloss development, stain resistance, and/or water resistance (hydrophobicity).

**TAMOL™ dispersant benefits**

| | PolyAcid | Hydrophilic copolymer | Hydrophobic copolymer |
|---|---|---|---|
| Ultra-low VOC capable | Yes | Yes | Yes[1] |
| Easy to pour | Yes | Yes | Yes[1] |
| Dispersant efficiency | ••• | •• | •• |
| Gloss potential | • | •• | ••• |
| Water resistance | • | •• | ••• |
| Stain resistance | • | •• | ••• |
| ZnO stability | •[2] | • | ••• |
| Cellulosic thickener | ••• | ••• | ••• |
| ASE/HASE thickener | ••• | •• | • |
| HEUR thickener | • | •• | ••• |

[1]TAMOL™ 681 Dispersant contains solvent and is higher in viscosity.
[2]TAMOL™ 851, 901, 960, 1254 have good ZnO stability.

• = fair; ••• = best

| TAMOL™ | Solids % | Salt | pH | Solvent | User Level on Inorganic Pigment* | Features |
|---|---|---|---|---|---|---|
| **Polyacid Dispersant** | | | | | | |
| 945 | 45 | Na | 6-8 | Water | 0.3-1.0% | Excellent cost/performance balance; Low foam. |
| 963 | 35 | $NH_4$ | 9-10 | Water | 0.3-1.0% | Low cost-in-use, non-foaming dispersant; Good water resistance. |
| 983 | 35 | K | 6-8 | Water | 0.3-1.0% | Low cost-in-use, non-foaming dispersant; Excellent color acceptance and viscosity stability. |
| 1254 | 35 | Na | 6-8 | Water | 0.3-1.0% | Excellent cost/performance balance; Low foam; Good color acceptance and stability with reactive pigments. |
| 851 | 30 | Na | 9-11 | Water | 0.6-1.0% | High efficiency with low foam generation; Excellent stability with ZnO and other reactive pigments; |
| 901 | 30 | $NH_4$ | 9-10 | Water | 0.6-1.0% | High efficiency with low foam generation; Excellent stability in paints containing ZnO and other reactive pigments; Ammonia version of TAMOL™ 851 Dispersant. |
| 960 | 40 | Na | 8-10 | Water | 0.6-1.0% | High efficiency with low-foam generation; Excellent compatibility with ZnO and other reactive pigments. |
| **Hydrophilic Copolymer Dispersants** | | | | | | |
| 1124 | 50 | $NH_4$ | 6-8 | Water | 0.5-1.5% | Broad formulating latitude; Excellent cost/performance balance; Low foam. |
| **Hydrophobic Copolymer Dispersants** | | | | | | |
| 731A | 25 | Na | 10-11 | Water | 0.75-2% | Workhorse hydrophobic dispersant; Good pigment wetting; Excellent overall compatibility |
| 165A | 21.5 | $NH_4$ | 8-9 | Water | 0.75-2% | Excellent early blister resistance and wet adhesion; Low thickener demand, enhancing stain removal performance; Good color acceptance; Good gloss development |
| 2002 | 42 | N/A | 3-5 | Water | 1.0-5.0% | Allow for neutralizer choice; Maximizes gloss potential; Good corrosion resistance. |
| 2011 | 27.5 | K | 8-10 | Water | 1.0-5.0% | Maximizes gloss potential; Enhance viscosity retention on tinting; Enhanced application performance. |
| 681 | 35 | $NH_4$ | 9-10 | Water / Propanediol | 1.0-5.0% | Maximizes gloss potential; Good stability with ZnO and other reactive pigments; Good corrosion resistance. |
| **Polymeric Dispersants** | | | | | | |
| 2028** | 40 | Specialty | 4-6 | Water | 1.0-5.0% | Suitable for both organic and inorganic pigments; Excellent color properties; Great for pigment concentrates. |

These properties are typical but do not constitute specifications.
*Based on dispersant solids to pigment solids; with $TiO_2$ slurries, subtract 0.2% to 0.5%.
**Tamol 2028 Dispersant use level (solids/solids):: 8 - 30% on organic pigments; 10 - 60% on carbon black

**For more information, contact Dow Coating Materials**

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dow.com/coatingmaterials



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