



Paint Additives for non-aqueous coatings

1. Introduction

Many kinds of raw materials are used in the process of paint formulation. These materials are divided into three main component groups, namely, resins, pigments and solvents. In addition, there is a group of additives which are used in small quantities. These additives are intended for improving the quality of paints by functioning in various ways.

Additives are increasing in variety as the industry's performance requirements become more demanding and complex. We can classify additives by the ways they function as shown in Table-1. Some of them have two or more functions.

This paper discusses thixotropic agents, dispersants and surface control agents popularly used in non-aqueous coatings.

Table-1 Additives for non-aqueous coatings classified by function

	Where to work	Additive
1	Paint production	Wetting agents, Dispersants
2	Paint stored	Anti-settling agents, Anti-skinning agents
3	Coating application	Anti-sagging agents, Defoamers, Electrostatic properties modifier,
4	Film formation	Anti-sagging agents, Leveling agents, Anti-floating/flooding agents, Defoamers, Curing accelerators
5	Cured film (After film formation)	Anti-floating agents, Marresistance agent, Matting agents, Anti-static agents, Slipping agents, Flame retardants,

2. Thixotropic agents (Anti-sagging agents, Anti-settling agents,)

A coating is required to have two contradicting characteristics. One is the low viscosity so that it would flow with ease when shear is applied to it and the other is enough viscosity to prevent sagging when the shear is removed. This change in viscosity desired of a coating is called thixotropy and thixotropic agents are used to make a coating which meets this requirement.

A thixotropic agent or its swollen particles, added in small quantity, mildly flocculate together to build a three dimensional network structure in the paint (Fig-1). This network is readily broken down by stirring or shear stress generated during application (brushing or spraying), which leads to the seemingly lower viscosity of the paint. When the substance is not disturbed, the network quickly re-forms, raising the viscosity.

Fig. 1



(a) Organo clay (b) Castor wax Amide wax (c) Silica

2-1. Effect of thixotropic agents

Thixotropic agents modify rheology of dispersion systems and offer the following benefits by increasing the apparent viscosity at a lower shear.

- A) Prevention of sag during coating application and Controlled film thickness.
- B) Anti-settling in the paint storage and Easier redispersion of settlement.

Photo 1

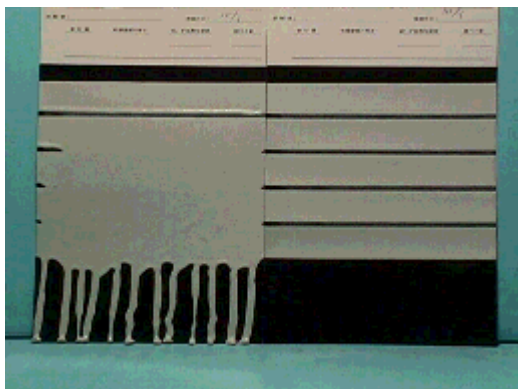
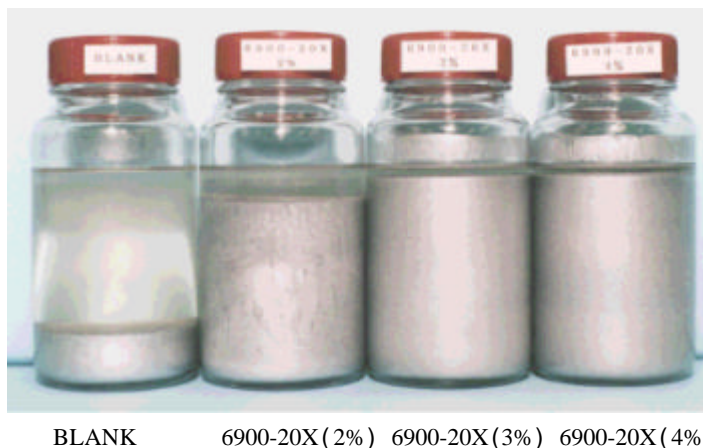


Photo 2



- C) Improved brushability

Fig. 2



2-2. Classification of thixotropic agents

Thixotropic agents now available in the market are divided into two families, Inorganic and Organic based products as given in Table-2.

Table-2

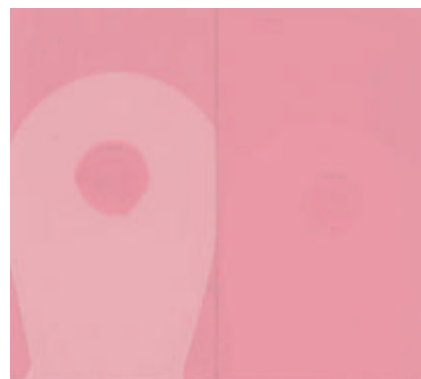
	How to work	Material
Inorganic	Fine colloidal dispersion	Colloidal silica, Organo bentonite Calcium carbonate
Organic	Network structure made with swollen particles	Hydrogenated castor oil Amide wax Metal soaps Solbitoles
	Network structure with swollen particles and pigment.	Oxidized polyethylene waxes Polymerized vegetable-oils
	Network structure formed by flocculation with pigment	High alcohol sulfonate polyester of dimers etc.

3. Pigment Dispersants (Wetting agents)

In manufacturing paints/printing inks, it is extremely difficult to get pigment dispersed uniformly in the vehicle. Many types of wetting/dispersing agents have been tried and used for this purpose. However, the fact is that, so far, we have found only a few products that can work with a small dose without impairing film properties.

3-1. Effect of Wetting/Dispersing agents

- a) Lowering viscosity of millbase
- b) Making pigment concentration of millbase higher
- c) Making dispersing time shorter
- d) Preventing pigment flocculation
- e) Controlling settling
- f) Preventing floating/flooding of mixed pigment systems
- g) Improving color development
- h) Improving film gloss



3-2. Classification of Wetting/Dispersing agents

Surface active agents for non-aqueous systems are classified by the functions of raw materials as follows.

1. Anionic compounds
Aliphatic alcohol sulfates Alkyl sulfonates etc.
2. Cationic compounds
Aliphatic amines Aliphatic amine salts Quaternary ammonium salts etc.
3. Electrically neutral compounds
Oleylaminooleate etc.
4. Amphoteric compounds
Amino acid salt Betaines etc.
5. Others
Condensation oligomers etc.

4. Surface control agents

Foaming that has occurred in the process of manufacture, coating application or as a result of other handling causes film defects. Other factors such as presence of contaminants in the paint or on the substrate can cause pinholes, craters, orange-peel, floating etc.

Surface control agents are used to prevent these defects and improve the film quality.

4-1. Defoaming agents

Foaming can occur at any stage of handling, including manufacture and application. Occurrence of foaming is intricately related to the types of resin, pigment, air temperature and many other factors.

Diversity of the cause makes foaming very difficult to deal with.

The property particularly required for defoaming agents is the persistence of defoaming effects.

For the defoaming effects to last longer, the substance should work to suppress rather than to kill the foam. In addition, applied film should have a smooth surface. Therefore, defoaming agents must have a leveling property as well.

Silicone oils are typical materials used to manufacture defoaming agents for non-aqueous paints.

Non-silicone materials include metal soaps, polyacrylates, polyvinyl etc.

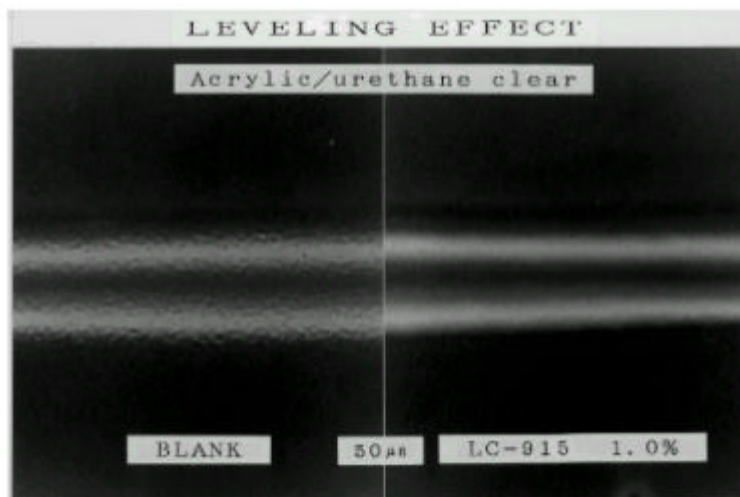
Photo4



4-2. Leveling agents

Leveling agents deal with pinholes, craters, orange-peel, floating, roller marks, and also other surface irregularities which develop in the process of film formation. These defects are related to the increase of paint viscosity, the curing property of resins, solvent evaporation, lack of uniformity in surface tension of the paint, etc.

Photo 5



Leveling agents are usually designed to increase wetting of the substrate by lowering surface tension (or interfacial tension) of the paint as well as by assisting the paint to flow well by improving pigment dispersion.

Raw materials used to manufacture leveling agents include high-boiling-point solvents, dimethylpolysiloxane, polyalkyl acrylate, cellulose acetate butyrate, fluoride, etc.