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Types and performance characteristics of thixotropic agents

1. Introduction

There are a great number of paint additives, among which thixotropic agents are particularly important and essential material in formulating paint systems.

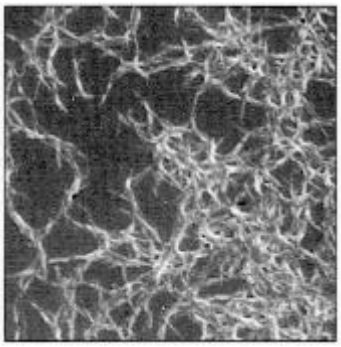
Thixotropic agents are classified into two categories, organic and inorganic thixotropic agents. The organic thixotropic agents include not only mono component products, but also hybrid types as well as pre-activated products. This diversity of product types has made it necessary for people in the paint industry to better understand the types available and their characteristics when they make a proper selection of additives. This paper discusses the organic thixotropic agents.

2. Types of Organic Thixotropic Agents Classified According to Raw Materials

Raw materials used for thixotropic agents include castor wax, amide wax, polyethylene wax, polymerized vegetable oil, some surface active agents and mixtares or combinations of two or more of these materials.

◇ Castor Wax

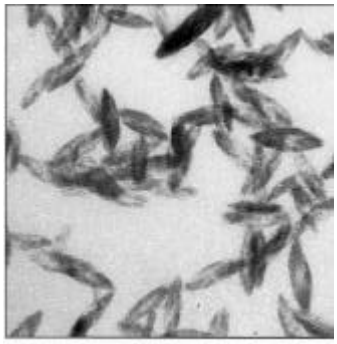
Photo No.1



Castor wax is obtained by hydrogenating castor oil. This wax has a tendency to swell into a thixotropic gel structure in some solvents at a high temperature. Castor wax is now offered as a thixotropic agent in the form of powder. This types of thixotropic agent can work in a broad range of systems from clear varnish to enamels. However, there is one drawback, which is that the wax can cause seeding due to its inherent property to solubilize and recrystalize in solvents heated up to 30 ～ 50 ℃. Photo No.1 shows swollen particles of castor wax in a solvent at a high temperature.

◇ Oxidized Polyethylene Wax

Photo No.2



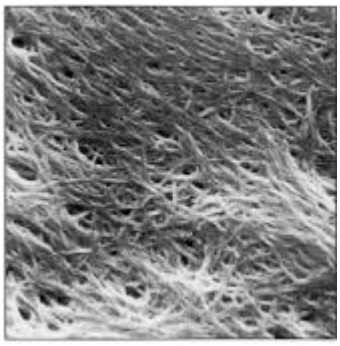
Oxidized polyethylene wax is a polyethylene wax which has some polar groups incorporated by oxidization. The wax, when dispersed in a coating system to make a colloidal dispersion, builds up a network structure together with pigment present there, giving a mild thixotropy to the system. This type of wax is offered as an anti-settling agent for enamels and supplied in the form of pre-gel for easier dispersion. One advantage of oxidized polyethylene wax is that the wax does not give the problem of seeding as the castor-wax-based products are likely to do.

Photo No.2 shows the colloidal dispersion of oxidized polyethylene wax.

◇ Amide Wax

Some types of the amide wax compounded with vegetable oil fatty acids and amines have the property to form a gel structure in some solvents as castor wax does.
The most desirable ones are offered as thixotropic agents in the form of fine powder or paste (wax pre-activated with solvent and heat). Just as in the case of castor wax products, these amide-wax-based thixotropic agents are used in a broad application area ranging from clear varnish to enamels.
It should be noted that you can handle amide-wax-based products with much less concern for possible seeding than castor-wax-based products because amide wax is rather difficult to solubilize in solvents.

Photo No.3



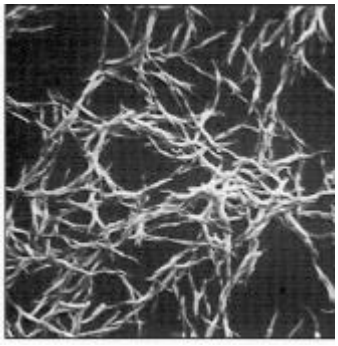


Photo No.4

◇ Polymerized Linseed Oil

Polymerized linseed oil has long been used in oil and alkyds paints for bodying purposes. This type of bodying agent, though it has a thixotropic nature to some degree, is not preferred in paint systems based on present-day technology, as its use increases viscosity much more than desired.

◇ Surface Active Agents

Dimmer acid esters and amine salts of sulfate etc. are used in oil and alkyds paints, but their use is limited because of their characteristics of wide selectivity particular to surface active materials.

◇ Hybrid Type(Amide wax/Oxidized polyethylene wax)

The combination of these two different materials makes a product with an interesting and unique property which makes up for the shortcomings of amide-wax-based products and which offers the benefit of oxidized polyethylene wax.
It is a widely accepted fact that amide-wax-based products cannot work as intended when dispersed too much. For this reason, the amide wax, in many cases, has not been used in highly pigmented systems such as heavy duty anti-corrosion paints. In the hybrid-type wax, the interaction between the two materials prevents excessive dispersion. Also structures are build up by the interaction of the hybrid-type wax with the pigments.
Therefore, grinding with the milbase brings out its effectiveness, and also does not raise viscosity too much.

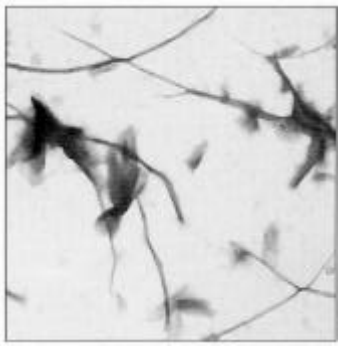


Photo No.5

This is why it is often used in high solid systems or solvent free systems.
With the hybrid type, you can duly expect further reduction in the possibility of seeding.
The hybrid type is supplied in the form of pre-activated paste.
Photo No.5 shows the swollen(activated) particles of a hybrid product.

3. Kusumoto Chemicals' Thixotropic agents

Raw material	DISPARLON	Appearance etc.	Application	Remark
Castor wax	#305	powder	Alkyds and oil paints	Castor wax
	#4300	powder	Alkyds and oil paints	Modified castor wax
Oxidized polyethylene wax	#4200-20	Paste 20% solids in Xylene	Universal use	Pre-gelled oxidized polyethylen wax
	#4200-10	Paste 10% solids in Xylene	Universal use Metalic paints Zinc-rich paints Aerosols	Pre-gelled oxidized polyethylen wax
	#4401-25M	Paste 25% solids in Petroleum naphtha	Universal use	Pre-gelled oxidized polyethylen wax
Amide wax	#6650	Powder	Heavy duty anti-corrosion coatings	Modified amide wax
	#6900-20X	Paste 20% solids in Xylene	Metalic base coats, Wood and Architectural coatings	Pre-activated amide wax
	A650-20X	Paste 20% solids in Xylene	Industrial top coats Heavy duty anti-corrosion coatings	Pre-activated amide wax
	A670-20M	Paste 25% solids in Petroleum naphtha	Heavy duty anti-corrosion coatings	Pre-activated amide wax
	F-9030	Paste 30% solids in Banzyl alcohol	Hi-solods coatings	Pre-activated amide wax
Hybrid Amide wax/ Oxidized poly-ethylene wax	NS-30	Paste 15% solids in Xylene	Conventional anti-corrosion enamels	Pre-activated waxes
	F-9010	Paste 30% solids in Xylene	Hi-solods heavy duty anti-corrosion enamels	Pre-activated waxes
	F-9050	Paste 100% solids in Resin	Non-solvent enamels Hi-solods heavy duty anti-corrosion enamels	Pre-activated waxes