

Introduction

Metallic Coating has been a fashion for coating since early 1980, specially in Road Vehicle Coating, Machinery and Plastic Paint. The main reason is due to the attractive appearance which was widely accepted in today's market.

Metallic coating formulator always facing the difficulty to ensure metallic pigments are evenly distributed in dry thin film. During spraying application, we can achieved the requirement of good orientation in the metallic pigments. However due to it relative big particle size, the metallic started to 'swim' in the wet coat once the spraying process have stopped. This will resulting the bright and dark spot appearance(Mottling appearance) which is clearly noticeable after drying. This relate the requirement onto the use of the additives that can restrict the movement of the metallic pigment once the shear force from the application tool is removed.

Metallic Pigment orientation Agents

Today there are many metallic orientation agents available in the market. Here we analyze the pro and con of varies metallic pigment orientation agents which is currently available.

a) Surface Tension Modifiers

The basic ideal on using this product is to give an even surface tension for the surface of the coating during the solvent evaporation process. This means the mobility of the pigment is reduce as there are almost even forces on the surface that will not disoriented the metallic pigments. The basic chemicals groups are mainly organic modified Polysiloxane, Polyacrylic and Fluorocarbon modified Polyacrylic. These are all surface tension modifier surfactants that only restricted the use in trace amount due to price limitation and most important they will cause serious side effects if the dosage is too high.

b) Pigment Wetting Agents

The principle on how a wetting agent can perform as a metallic orientation agent is by using the control flocculation theory. The pigment affinity groups presented in the wetting agent are quite polar which promote localized hydrogen bonding. Thus if we look at the whole picture, it appear like a spider net that hold the metallic pigment which is disable them to move in wet film after the external shear force is withdraw.

These pigment wetting & dispersing agent carries acid and/or amine value that can affect the long term storage stability. The acid and amine value need to be presented as pigment affinity group. Without them, they are not performing efficiently the desire wetting and dispersing properties. Here again the dosage is in the range of 0.05 to 0.15 based on total formulation. Higher amount will cause the metallic pigment turning dark in color.

c) Anti-Settling Agents

In all metallic coating, anti-settling is essential to be presented in the formulation in order to avoid hard settling after storage. This is due to metallic pigments are quite heavy. The specific gravity of those mentioned pigments are in the range of 1.5 to 1.8. In addition to the relatively big particle size, the range of 20 to 50µm, resulting higher tendency to settle.

Anti-settling agents will help to provide orientation property to the coating. The basic ideal is almost the same as in wetting agent which also make use of the network linkage to hydrogen bonding. However the effect is not enough to give a good workability and the metallic pigment will still 'swim' if the coating is too wet. Further more there is a limit to use the anti-settling agent. Over recommended dosage will give over coating adhesion problem, base coat adhesion problem to primer, leveling on the base coat and properly haziness in clear coat.

Generally in order to obtain a good orientation effect, a single additive from the above mentioned cannot perform sufficient desire result which guarantee good workability and obtain brighter appearance. However in most cases, formulators are too scare to use those that help in orientation but will also provide side effects.

[Ethylene Vinyl Acetate](#) is widely accepted as an efficient, less problem and user friendly additive for metallic pigment orientation. Basically, they are supplied in low solid form, at about 6% to 7% in active ingredient. However they have been re-crystallized to fine particles in order to increase the efficiency in covering more surface area.

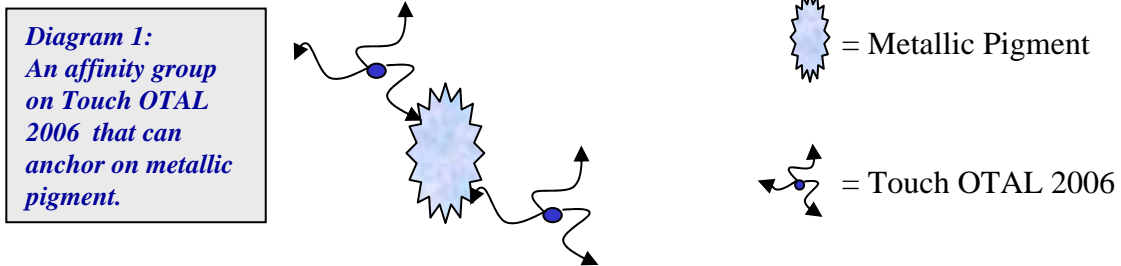
With the help of such product, a very good metallic orientation [Touch OTAL 2006](#) can be effectively achieved and illustrated in next page.

Touch OTAL 2006

Touch OTAL 2006 is made out of small fine particles (<25µm) of Ethylene Vinyl acetate Co-Polymer wax which is stabilized with CAB. It works a bit differently in performing the orientation function from the above mentioned products.

a) Affinity Group To Anchor On Metallic Pigment

It contains an affinity group that can easily perform an anchoring process to the surface of metallic pigments. With this function, there is a difference from the orientation agents that have been mentioned above which give a more direct contact to the surface of pigments and hold or bite them up far more firmly. It reduces the possibility of loss or free metallic pigments that are resulting in a metallic swimming effect. The process is as shown in diagram 1.



b) A Network Linkage By Hydrogen Bonding

As we learn in chemistry, all polar groups can supply a hydrogen bonding process to the system, and in this case, there is no exception. A hydrogen bonding linkage network is formed from a very special design and distributed polar group that gives a resistance for the metallic pigments to move, once the shear force is being removed. They are specially designed in the sense that the network is very efficient without causing the metallic pigment to 'stand up', which causes seeding and rough surface problems to the finishing.

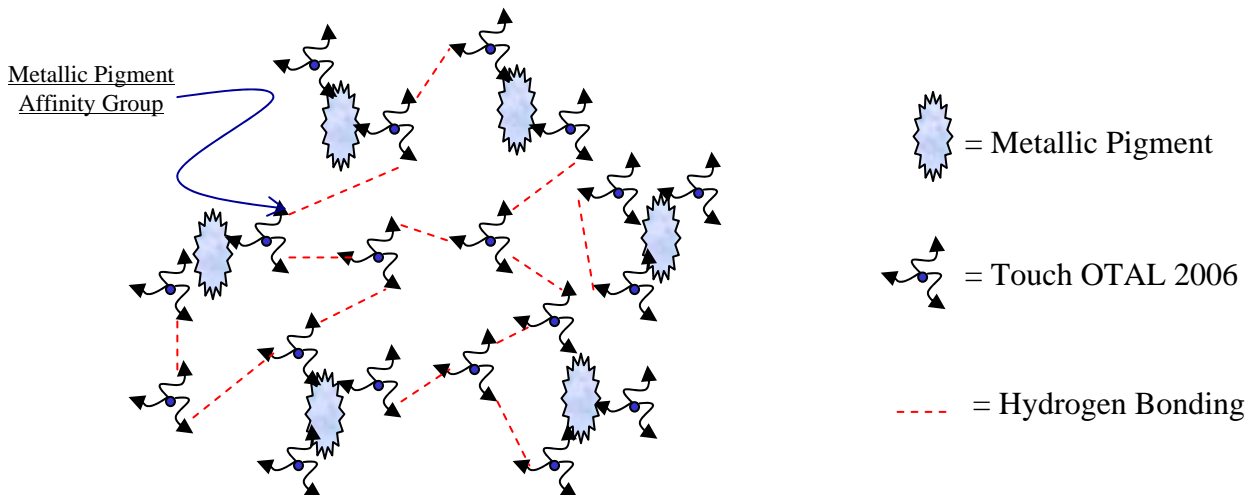


Diagram 2: *An affinity group on Touch OTAL 2006 that can anchor on metallic pigment. Followed by a hydrogen network that resists the movement of the metallic pigment once the external shear force is removed.*

c) Low Solid For Collapsing Effect

All metallic pigments are sharp in a flake or dollar coin. Therefore the final laying or orientating is very important as they can be laying horizontally or vertically. Horizontal is the most preferable as this will enhance the brightness and avoid seeding problems. However if it is laying vertical, than the brightness and seeding will appear in the final coating. Vertical position of the metallic pigments is highly undesirable and every formulators are trying hard to avoid.

For metallic finishes, low solid on the metallic coat and fast drying properties is highly preferable. When a thin coat wet metallic paint or ink is applied, the solvents should evaporate fast with the low solid of the system, the whole film will collapses and forcing the the metallic pigments orientated themselves in the way that all are laying horizontally. This will allows the finishing to obtain more bright and even color. Please refer to the illustration below for clearer picture.

Touch OTAL-2006 is recommended at 5% to max. 25% on the total formulation. As the total solid of this product is 7%, it will contribute to reduce the solid of your metallic coat for a better collapsing effect.

