

Eastman cellulose acetate butyrate (CAB)—technical tip

Eliminating “orange peel” in industrial clearcoat formulations

Introduction

Cellulose acetate butyrate (CAB) is a very beneficial additive for resolving a number of surface defects such as cratering, fish eyes, and orange peel in various coatings based on different binders. Orange peel is a term used to describe an uneven surface with an appearance similar to that of the surface of an orange. This benefit was demonstrated by formulating a thermosetting melamine-acrylic clearcoat with and without Eastman cellulose acetate butyrate (CAB-551-0.2) applied over a commercial red basecoat. The formulations used are identified in Table 1. The test panels were deliberately contaminated with oil to emphasize the development of coating defects such as orange peel.

Table 1 Melamine-acrylic clearcoat formulations with and without Eastman cellulose acetate butyrate (CAB-551-0.2)

Component	Control, wt%	With Eastman CAB-551-0.2, wt%
Eastman CAB-551-0.2 cellulose ester ^a	—	10.00
Paraloid™ AT-400 ^b	45.00	42.50
Cymel™ 327 ^c	15.00	15.00
Eastman <i>n</i> -butyl propionate ^a	4.00	3.25
Eastman MAK (methyl <i>n</i> -amyl ketone) ^a	32.00	26.00
Eastman <i>n</i> -butanol (<i>n</i> -butyl alcohol) ^a	4.00	3.25
Total	100.00	100.00

^aEastman Chemical Company

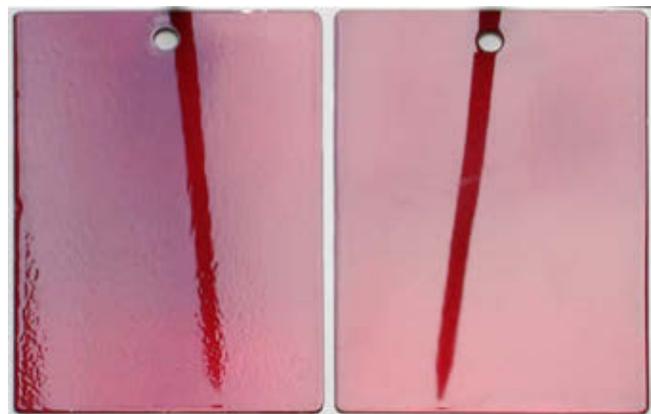
^bThe Dow Chemical Company

^cCytec Industries

Improved reflection and reduction in orange peel

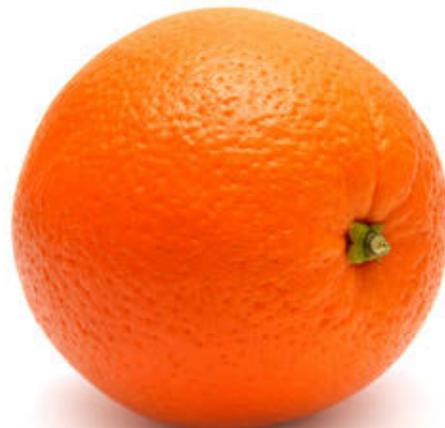
The panel without Eastman CAB-551-0.2 has a large number of defects which included a high level of orange peel. Orange peel, besides being unsightly, reduces the reflectivity and smoothness of the surface. The reduction in reflectivity is highlighted in Figure 1, which shows a reduction in the reflection of a pencil held above the surface. The panel containing Eastman CAB-551-0.2 has eliminated the orange peel and the reflectivity has increased such that the reflection of the pencil is more pronounced.

Figure 1 Improved reflection and orange peel reduction



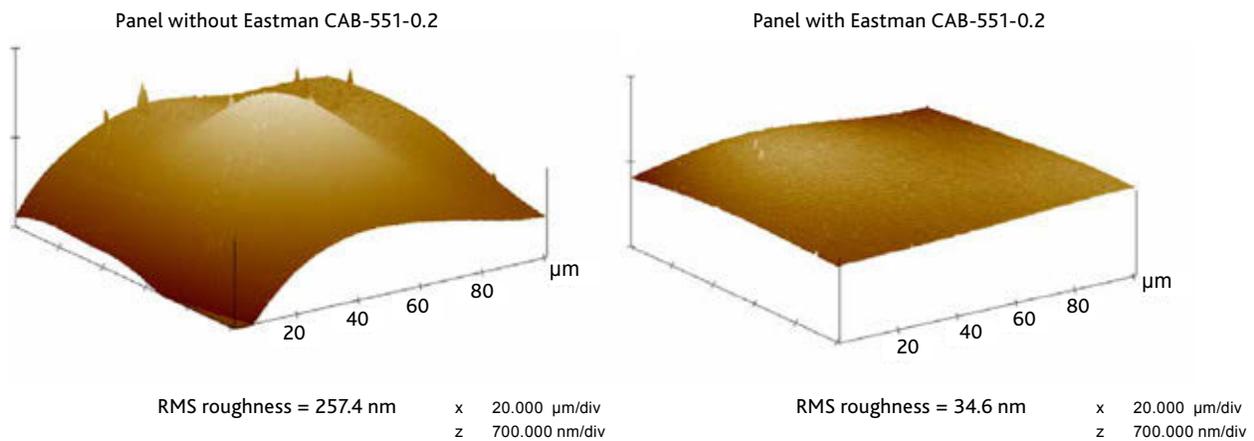
Panel without Eastman CAB-551-0.2—orange peel/less reflection

Panel with Eastman CAB-551-0.2—no orange peel/excellent reflection



Atomic force microscopy (AFM) was used to assess the surface roughness of the same panels used in the pencil reflection test. A higher root mean square (RMS) value indicates a rougher and more uneven surface. The panel without Eastman CAB-551-0.2 contains a large amount of orange peel and consequently produces a high RMS surface roughness value when measured with AFM. The panel with the clearcoat modified with Eastman CAB-551-0.2 shows a much smoother surface with no visible orange peel and a much lower surface roughness value. See Figure 2.

Figure 2 Atomic force microscopy of panel



Conclusion

Cellulose acetate butyrate (CAB) at additive quantities can resolve surface defects such as cratering, fish eyes, and orange peel in various coating systems based on different binders. This technical tip has shown that Eastman CAB-551-0.2 in a melamine-acrylic clearcoat has improved flow and leveling to such an extent that orange peel has been eliminated and the reflectivity has been significantly improved.



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