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Marshall Laboratory
May 12, 1953.MEMORANDUM REPORT NO. M-582Prepared by: J. P. SermatteiU.V. LIGHT ABSORBERS IN FURNITURE LACQUERSVISIT TO HERCULES EXPERIMENTAL STATION, WILMINGTONINTRODUCTION:

This visit was made on May 4 with Messrs. J. F. Conlon and H. B. Wagner to discuss Hercules' work with U.V. light absorbers in furniture lacquers.

PERSONS INTERVIEWED:

Mr. D. Lesser, Chemist
Mr. E. C. Hamilton, Chemist
Mr. R. F. Wint, Sales Development

SUMMARY:

in nitrocellulose furniture lacquers, Uvinul 400 and Uvinul 490 were found to be the most effective for preventing wood discoloration resulting from sunlight exposure of lacquered wood panels. Uvinul 400 was effective at a concentration of 0.75%, and Uvinul 490 at a concentration of 0.5% of the film solids, when tested at a film thickness of 3 mils.

While the Uvinuls appear to be the best of the available U.V. light absorbers for use in clear furniture lacquers, they are subject to certain limitations, the more important of which are:

- (A) High cost - Uvinul 400 is \$11.50 per pound and Uvinul 490 is \$12.75 per pound.
- (B) They are effective in preventing discoloration of some woods but not others. For example, they are effective over yellow birch and maple, but are not effective over bleached mahogany, white oak and black walnut. Hercules will send us more detailed data covering the effectiveness of the Uvinuls over various kinds of wood.
- (C) Uvinul 490 imparts a slight yellow color to the lacquer film and this will probably be objectionable over very light colored woods or white substrates.

According to Hercules, the Uvinuls are not effective in stabilizing the color of the nitrocellulose film, itself, on exposure to sunlight, but are only effective in preventing discoloration of the wood underneath. However, J. F. Conlon has found that Uvinul 400 is also effective in preventing the discoloration of a free-nitrocellulose film on exposure to U.V. light, provided that a sufficient concentration of the Uvinul 400 is used. Uvinul 400 also imparts no appreciable initial color to the film, being definitely better in this respect than Uvinul 490. Uvinul 400, therefore, appears to have more generally useful overall properties than Uvinul 490, except that higher concentration must be used for equal effectiveness.

In general, the Uvinuls appear to be interesting compounds for improving the stability and durability of films subject to sunlight exposure.

ACTION:

1. J. F. Conlon will test Uvinuls 400 and 490 in nitrocellulose lacquers over several woods.
2. H. B. Wagner has work in progress aimed at improving blister

resistance and durability of finishes through the use of the Uvinuls.

DISCUSSION:

Uvinuls 400 and 490 are commercially available from Antara Chemicals, Division of General Dyestuff Corporation, 435 Hudson St., New York. Uvinul 400 is benzoyl resorcinol, and Uvinul 490 is described as a substituted benzophenone. Uvinul 400 is disclosed in U. S. Patent 2,568,894.

Uvinul 400 is practically colorless and imparts no appreciable color to films in which it is incorporated. Uvinul 490, on the other hand, is a tan powder and imparts a slight yellow color to films. Both Uvinuls 400 and 490 show strong absorption characteristics for U.V. light in the range 3000 to 3800 Angstrom units. Normal types of window glass filter out wavelengths below 3000 Angstroms, and the range 3000 to 3800 is believed to cause most wood discoloration indoors. Both Uvinuls have exceptionally good stability to continued exposure to sunlight and they also are stable to temperatures up to 210°C. for several hours. They are soluble in alcohols and insoluble in water and aliphatic hydrocarbons.

Hercules tested the Uvinuls in the following film composition that was designed to have good inherent light stability:

1/2 second R.S. nitrocellulose	50%
Cellolyn 502 (a PE cocoanut oil alkyd)	35%
Dibutyl phthalate	15%
Total	100%

Uvinul 400 was tested at a concentration of .75% of the film and Uvinul 490 was tested at a concentration of .5%. The lacquers were applied over many woods at a film thickness of 3 mils. These panels were then exposed under glass at 45°S. for 15 days, with controls that did not contain the Uvinuls. The test panels shown us indicated that the Uvinuls were quite effective in preventing wood discoloration in numerous cases, although there were also many woods where no beneficial effect was obtained. The lacquer film itself was first tested for yellowing by applying it to white procelain and exposing to sunlight under the same conditions as the wood panels.

J. F. Conlon's work has shown that concentrations much higher

than .5 and .75% were needed to obtain the improvements claimed for the Uvinuls. This difference in results is probably due to the fact that Conlon's tests were made at lower film thicknesses and that he was looking for effects in the films as much as for effects in the wood.

Other suggested uses for the Uvinuls are as U.V. light absorbers in:

- (a) Transparent shades for store windows to protect merchandise from fading.
- (b) Paper, leather and textiles to protect from deterioration.
- (c) Sun oils, creams and lotions.
- (d) Floor and furniture polishes and waxes.
- (e) Adhesives
- (f) Plastics

J. F. Conlon has data sheets giving more detailed information on the Uvinuls.

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