TABLE II

Hydrogenation of Methyl Linoleate[a]

| Catalyst systems | Stearate (%) | Monoene (%) | Diene (%) | Conj. diene (%) 232 mμ | *trans* % as Eladiate |
|---|---|---|---|---|---|
| 1 | 0.1 | 69.5 | 30.4 | 3.85 | 21.5 |
| 2 | 0.2 | 75.5 | 24.3 | 1.03 | 34.4 |
| 3 | 0.0 | 80.3 | 19.7 | 2.05 | 38.8 |
| 4 | 0.4 | 89.0 | 10.6 | 2.10 | 51.7 |

Hydrogenation of Methyl Linolenate[a]

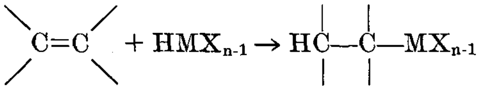
| Catalyst systems | Stearate (%) | Monoene (%) | Diene (%) | Triene (%) | Conj. diene (%) 232 mμ | *trans* % as Eladiate |
|---|---|---|---|---|---|---|
| 1 | 0.0 | 53.1 | 29.1 | 17.8 | 3.82 | 30.3 |
| 2 | 0.0 | 64.8 | 22.7 | 12.5 | 4.01 | 35.7 |
| 3 | 0.0 | 68.2 | 21.2 | 10.0 | 2.04 | 38.9 |
| 4 | 0.0 | 74.9 | 17.5 | 8.5 | 1.85 | 43.2 |

[a] Reactions were carried out at 150 C for 2 hr under a hydrogen pressure of 150 kg/cm². Catalyst systems (1–4) and solvent were the same as in Table I; 8.5 g of methyl linoleate (or methyl linolenate) were used in each experiment.

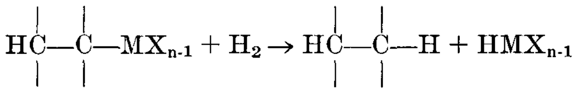
steps are postulated, as suggested by Sloan et al. (7). The reaction of transition metal derivatives with aluminum alkyls has, as its first step, alkylation of the transition metal derivative [1]. This is followed by hydrogenolysis of the metal-alkyl bond to yield a metal hydride [2], which then, added to an olefin, forms a new metal alkyl [3]. Hydrogenolysis of the latter yields saturated hydrocarbon with regeneration of the metal hydride [4].

$$R_3AlX + MX_n \rightarrow R_2AlX + RMX_{n-1} \qquad [1]$$

$$RMX_{n-1} + H_2 \rightarrow RH + HMX_{n-1} \qquad [2]$$



$$\gt C{=}C\lt + HMX_{n-1} \rightarrow HC{-}C{-}MX_{n-1} \qquad [3]$$



$$HC{-}C{-}MX_{n-1} + H_2 \rightarrow HC{-}C{-}H + HMX_{n-1} \qquad [4]$$

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# Paint Driers-Effect of Organic Acid Carrier

The effect, mechanism, and faster drying rates imparted to surface coatings by the metal portion of paint driers have been covered extensively in textbooks (1–3) and other publications. The organic acid carrier for the metal has also been described; however, little information has been published on the direct effect that this portion of the drier system exerts on the drying rate. Under carefully controlled conditions, studies have been conducted to determine what effect, if any, the acid carrier plays in the drying process. In this evaluation, naphthenic acid (4) and neo-decanoic acid (5) (a synthetic *α,α*-disubstituted monobasic acid containing 10 carbon atoms) were used as the organic acid carriers.

In all tests, the three enamel formulations which contained the neo-acid driers dried faster than similar paints which contained corresponding amounts of naphthenate driers. The differences in drying rates effected by the neo-acid and naphthenic acid driers were quite significant in some tests and marginal in others, depending on the particular paint formulation.

Two drier systems were evaluated with the cobalt soap as the sole drier in one test and a combination of cobalt and lead soaps in the second. The cobalt and lead naphthenates were obtained commercially; the corresponding neo-acid driers were prepared by a laboratory procedure similar to that used in the commercial production of naphthenate driers (6).

The drier systems were evaluated in the long- and medium-oil alkyd test enamel formulations shown in Table I. The results of this study are summarized in Table II and show that the type of organic acid carrier does affect drying time. Paint driers prepared with the synthetic neo-acid offer faster drying

TABLE I

Test Enamel Formulations

(Modified formulations based on "starting-point" formulae recommended by Reichhold Chemicals Inc.)

| | I | | II | | III | |
|---|---|---|---|---|---|---|
| | Weight | Volume | Weight | Volume | Weight | Volume |
| $TiO_2$ R-900[a] | 309.5 | 8.8 | 301.2 | 8.6 | 301.5 | 8.6 |
| Kadox 515[b] | ........ | ...... | 25.7 | 0.6 | 15.1 | 0.3 |
| Syntex 40[c] | ........ | ...... | ........ | ...... | 548.8 | 62.6 |
| Beckosol P-296-70[d] | ........ | ...... | 489.9 | 61.2 | ........ | ...... |
| Beckosol P-670-55[e] | 522.2 | 69.2 | ........ | ...... | ........ | ...... |
| Nuosperse 657[f] | ........ | ...... | 3.5 | 0.5 | ........ | ...... |
| Varsol 1[g] | ........ | ...... | 179.7 | 26.7 | 134.6 | 20.0 |
| VM&P naphtha[g] | 168.3 | 26.4 | ........ | ...... | ........ | ...... |
| | 1000.0 lb | 104.4 gal | 1000.0 lb | 97.6 gal | 1000.0 lb | 91.5 gal |
| Weight/Gallon | 9.58 lb | | 10.24 lb | | 10.93 lb | |
| PVC | 22.3% | | 19.2% | | 15.6% | |
| NVM | 59.7% | | 67.3% | | 73.9% | |
| Pigment/Resin solids ratio | 1.078/1.000 | | 0.953/1.000 | | 0.740/1.000 | |

[a] E. I. duPont de Nemours and Company.
[b] Zinc oxide (N. J. Zinc Company).
[c] Long-oil soya alkyd (Jones-Dabney Company).
[d] Long-oil soya alkyd (Reichhold Chemical Company).
[e] Medium-oil linseed alkyd (Reichhold Chemical Company).
[f] Wetting agent (Nuodex Division of Tenneco Chemicals Inc.).
[g] Humble Oil and Refining Company.

properties when compared with similar driers based on naphthenic acid. The drying rates shown in Table II were determined with the conventional finger-tip touch method (ASTM D-1953).

TABLE II

Drying Times in White Enamel Systems

| Coating formulation (see Table I) | Drier concentration[a] | Type of drier | Set-to-Touch time (minutes)[b] |
|---|---|---|---|
| I | .05% Co | Naphthenate | 34 |
| | .05% Co | Neo-decanoate | 27 |
| II | .05% Co | Naphthenate | 151 |
| | .05% Co | Neo-decanoate | 120 |
| III | .05% Co | Naphthenate | 181 |
| | .05% Co | Neo-decanoate | 169 |
| I | .05% Co + .50% Pb | Naphthenate | 29 |
| | .05% Co + .50% Pb | Neo-decanoate | 21 |
| II | .05% Co + .50% Pb | Naphthenate | 133 |
| | .05% Co + .50% Pb | Neo-decanoate | 126 |
| III | .05% Co + .50% Pb | Naphthenate | 118 |
| | .05% Co + .50% Pb | Neo-decanoate | 107 |

[a] Percentage of metal based on total vehicle solids.
[b] Finger-tip touch method (ASTM D-1953).

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# Color Reactions of Red Palm Oil

AMMONIUM MOLYBDATE-sulfuric acid reagent is reported to give a specific color or turbidity reaction with some fatty oils (1). Experiments at this laboratory revealed two interesting facts (2). Ammonium molybdate does not have any part in the reaction, and an identical response is obtained with concentrated sulfuric acid alone under the same experimental conditions. Red palm oil gives an intense green-blue coloration, which is attributed to the presence of lycopene (3) in the oil. This observation is confirmed by the following.

Bleached palm oil does not give a color in the test because of the destruction of lycopene during the bleaching process. Red palm oil gives the green-blue coloration by direct contact or in nonaqueous media with arsenic trichloride, antimony trichloride, and trichloroacetic acid, which are specific reagents for lycopene, resulting in formation of the unstable carbonium salts (4).

These reagents are rather sensitive both in regard to the size of the sample and the concentration of lycopene. Thus, when a drop of red palm oil is placed on a porcelain tile and a drop (of arsenic trichloride) or crystals of the other two reagents are added and stirred with a glass rod, a blue-green color appears. Peanut oil to which 5% by weight of red palm oil has been admixed responds to these reagents, especially on a porcelain tile by direct contact.

The causal role of lycopene in the reaction has also been checked by extracting lycopene from fresh and ripe tomatoes with petroleum-ether-acetone and dissolving it (lycopene) in peanut oil and bleached palm oil and performing the test with the use of the four reagents (including concentrated sulfuric acid). A green-blue coloration results in all cases.

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## • *Erratum*

"Whiteness and Fluorescence of Fabrics," K. J. Nieuwenhuis, JAOCS *45*, 37–42, 1968. On page 39, left-hand column, last line, the "$G < 82$," should read "$G > 32$."