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REPORT

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Name of Co.: THE ROESSLER AND HASSLACHER CHEMICAL CO.

Department : SYNTELLAC

Subject : NOTES ON CIRCULARS AND SCIENTIFIC PAPERS, BUREAU OF STANDARDS.

Author : A. L. PITMAN Date June 26, 1925.

CIRCULAR 117 - U. S. Government Specifications for Interior Varnish.

A list of specifications for all such varnishes. The only test required for which we have not apparatus is that of flash in a closed cup. The required value is so low, 30°C., that we should pass it on alcohol solutions of Syntellac readily. It is required that the solution be clear, which would limit us to grade "F".

No composition of Syntellac, to my knowledge, will stand the 18 hours water immersion required without whitening.

A rubbing test is given on P. 5. Most artificial lacs are unsatisfactory for rubbing work.

There appears part missing, though the page numbers are consecutive.

CIRCULAR No. 69 - Paint and Varnish

Issued in 1917 - 83 pp.

Little mention of shellac

P. 27 for reference on shellac varnish analyses

P. 59 Shellac for a liquid filler on closed grained wood.

P. 80 and 81 A brief glossary of terms.

A good brief review of paint and varnishes as a whole.

CIRCULAR No. 471 - Methods of Measurement of Properties of Electric Insulating Materials.

ELECTRICAL PROPERTIES:

Phase difference. This is a measure of the power loss. It is the most important test for high frequency work. Low power loss in radio work means sharper tuning. When this test is made, the dielectric constant is readily figured, also. Sample apparently required is quite large - about 12" x 12" x 1/4", to judge from picture.

Surface Resistivity. A block of 10 x 10 x 1 cm is about the size used. This value depends on the humidity.

Flash-over Voltage at radio frequency. A block 10 x 10 x 1 cm is used.

Endurance Test.

Break-down Voltage. The apparatus is not specified precisely. A molded cup is specified for this by A.S. T. M. In Ellis, the electrical properties tabulated are:-

Surface resistivity at 50% relative humidity (Ohms)

Phase difference at radio frequencies (degrees)

Dielectric constant (farads)

Dielectric strength (volts per mm.)

OTHER TESTS:

Density and Moisture. Use a 5 x 10 cm sheet of thickness as furnished for this. (N.B. This work was on laminated products). Express as gm. water absorbed per $cm.^2$ surface.

Tension. The modulus of elasticity is difficult to get as the extension is so small in two inches that a very delicate extensometer is required which is liable to be broken at the break of the piece. They had some trouble on the breaking strength, until they got jaws which permitted some self-alignment of the specimen.

Impact Strength. The dimensions of the specimen used are given. It is not stated whether these are for the standard Charpy specimen. These dimensions given are 7-1/2 x 1 x 1 cm.

It is probable that an instrument for this determination could easily be constructed. The principle employed is that of measuring the reduction in the energy of a pendulum which has broken the test piece.

Permanent distortion. These tests are made on a 12 inch span. It is possible the transverse molded piece for the transverse test would be suitable.

Machining qualities. So far as I know, the type of composition in which we are interested is not used for machining.

Thermal expansion. This was tested on a 30 cm. x 1 x 1 cm. piece in an electrically heated air oven and using travelling microscopes for the measurement. (For pure iron I find the thermal expansion is 6.7×10^{-6} per °F. For shellac molding stuffs it is 12 to 23×10^{-6} per °F. According to Ellis, the compounds of low value give less trouble in complicated molds.

A.S.T.M. Preprint 1926. - Report of Committee D-9 on Electrical Insulating Materials.

The following are some of the suggestions which have been put forward. Those chosen here appear to be of direct interest to us.

Compression test. A cylindrical block which is higher is recommended to replace the cube at present recommended. The dimensions are to be 1-1/4" high x 1.128" diameter.

Accuracy of tests. Machines are to be good to 1% at the lowest value used. A spherical bearing block is specified for the compression test. In the various tests, the machine running idle shall have a cross-head speed not to exceed 0.050 inches per minute.

Impact test. Three machines of the Izod type have been made.

Some progress was achieved, but the Committee is no ready to make recommendations. (From Mr. L. D. Williams I find that in the Izod type a notched specimen is held vertical at one end. It is broken by the impact of a pendulum striking at a definite point above the notch and opposite to it. The loss in the pendulum's energy is recorded).

The flash-over Voltage Test is found not well suited to the purpose intended.

Surface and Volume Resistance have been found very difficult to separate.

CIRCULAR 234 - INSULATING PROPERTIES OF SOLID DIELECTRICS:

Descriptions are given of apparatus and calculations required in determining the volume and surface resistivities of materials.

The effects of humidity and temperature are discussed.

The surface restivity is shown to be due to a surface film, usually of water or of oil, on the insulator. This is generally the important factor in determining the leakage between two conductors insulated by a solid dielectric.

Rosin has a higher surface resistance than orange shellac which is better than white shellac (P.389).

Sealing wax containing both is nearer rosin.

Shellac has as high a volume resistivity as the best bakelite furnished in 1914 (P.373).

Waxes compared with commercial resins are unique in two respects. (See P.388 and 392-393).

1 - The surface restivity of waxes is very high compared to resins.

2 - The change with humidity is very little.

COMMENT:

It would be well for the foregoing to be borne in mind, for if some wax can be used, perhaps shellac wax may serve, there are three possible good effects to one possible bad one. The three good ones are:-

1 - Increased surface resistance, particularly when damp.
2 - Less sticking (waxes aid here).
3 - Improved water resistance which is of importance in phone pieces subject to a misty spray.

A possible bad effect is that waxes, especially when in large amount, weaken.

CIRCULAR No. 352 - Expansion of Insulating Materials.

Bakelite type compositions range between 20 and 40 x 10^{-6} expansion per °C. Hard rubber is 80 x 10^{-6} per °C (P.409).

Above 60°C a shrinkage sets in which may be quite marked, so much so as to be determinable by sp. gr. measurements.

Other materials as porcelain are also considered.

A.S.T.M. Preprint by A.H. Pfund. - Tests for Hardness, Gloss Color and Leveling of Varnishes.

(N. B. A. H. Pfund, Professor at Johns-Hopkins, did and directed the work recorded here for Du Pont.)

Hardness. The scale is that of the force required to press a 2 mm. diameter sphere into a film to a given depth. The indentations are measured when the pressure is still applied.

Films prepared by whirling disc method (Walker and Thompson A.S.T.M. 22 II P.465 1922).

Gloss. Gloss is defined as the ratio of specularly reflected light to that reflected by a true plane of the same material at the same angle. (Elsewhere in paper testing, Ingalls has a "glarimeter" in which this is defined as polarized to the total reflected. Reflection is made at the polarizing angle). For "normal" gloss the image of two parallel wires 0.3 mm. diameter and 0.3 mm apart, are viewed by reflection from the surface. "Resolving" power is better, the more slanting the reflection; determine the angle where the two wires are seen separate. Then measure intensity of specularly reflected light at that angle.

For "high" gloss another method is given.

For color - Pfund uses two comparator wedges. One is amber glass, the other is hollow for the varnish.

Leveling. This is concerned with obliteration of brush marks.

A.S.T.M. Preprint No. 49 (1925). - A recording drying time meter for varnishes and similar materials J.McE. Sanderson.

S. has developed a machine for measuring the drying time. This gives consistent results; shows the time to the loss of tackiness; the time to hard-dry. He uses as a measure of the first, the time period in which sand on the film cannot be brushed off later. For the time to hard-dry, he used the time during which the sand can just be tapped off.

S. points out that in furniture manufacture, the finishing process coming at the end when schedule interruption is most serious, so that the drying time is an important factor.

B. OF S. SCIENTIFIC PAPER NO.278 - An Investigation of the Laws of Plastic Flow. Eugene C.Bingham (1916).

According to this paper, when the packing of solid equal-sized spheres in a liquid is at the cubical condition, the percent of solid is a maximum for normal plastic flow. This is at 50% by volume of solids, nearly. When the solids percent is further increased to 74%, we have tetrahedral close packing. Beyond this point there will be insufficient liquid to fill the pores. Below 50% solids by volume, plastic flow is possible. The lower limit below which the mixture behaves as a liquid does not concern us here. Above 50% solids, flow is accompanied by rupture and movement on the slip planes with slipping.

Taking the formula used at the American Composition Corp., I find that this gives a solid percent by volume value of close to 50.