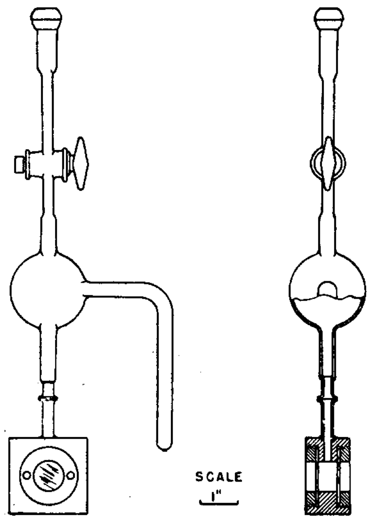

FIG. 1. Cell with silver chloride windows.

joint to a Fernico bushing which was sealed to AO glass and graded up to Pyrex through AJ and Nonex.

Fugassi and McKinney[3] report some transmission data for silver chloride. Their results are shown as the dotted curves on Fig. 2 for sheets 0.07, 0.29, and 1.20 mm thick. Their silver chloride contained some absorbing or scattering impurity, because their transmission varies with thickness. At 11 μ and at 15 μ, for example, their data give linear graphs when the logarithm of the transmission is plotted against thickness; the intercept at zero thickness gives 74 percent as the transmission left after losses due to

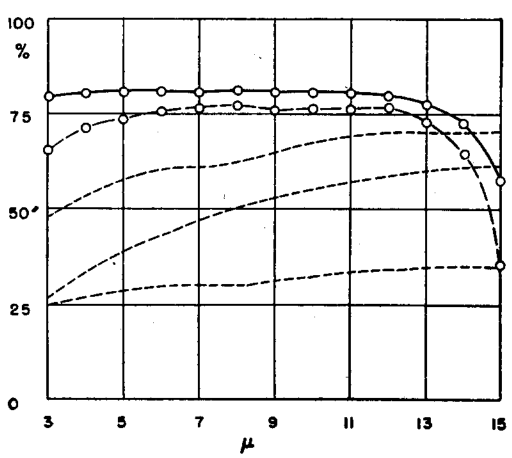

FIG. 2. Transmission of silver chloride.

reflection and surface scattering. The Harshaw silver chloride was uniform in transmission from 3 to 12 μ (solid curve of Fig. 2). The value of 80 percent is in good agreement with the theoretical value for reflection losses calculated from the index of refraction of silver chloride: using $n_{AgCl}=2.06$, the ratio of amplitudes of the reflected to the incident light is $(n_{AgCl}-n_{air})^2/(n_{AgCl}+n_{air})^2$ or 0.120, giving 88 percent transmission at one air—AgCl interface and 77 percent for both faces. The behavior of the Harshaw silver chloride beyond 12 μ is puzzling; the drop in intensity is due to a surface effect, because sheets 0.52 mm and 1.20 mm thick gave practically identical results. Rubbing one face of the silver chloride sheet with 4/0 emery paper gave the dashed curve of Fig. 2; the abrasion produced marked scattering in the visible and short infra-red, and enhanced the long wave losses.

The data were obtained using a sodium chloride prism spectrometer, manufactured by the Perkin-Elmer Corporation.

[1] Gilliam, Liebhafsky, and Winslow, J. Am. Chem. Soc. **63**, 801 (1941); **66**, 1793 (1944).

* The cell constant should be determined *after* determining sample transmission. If the sample is a mixture whose components differ much in boiling point, some fractionation occurs on re-evaporation, and it may take as much as several hours for diffusion to equalize concentrations through the tube connecting the two compartments of the cell. If a check determination after cell constant is desired, the sample should be "flashed" by putting a beaker of hot water around the freezing tube immediately after removing the liquid nitrogen.

[2] Norton, Gen. Elec. Rev. 1 (August 1944).

[3] Fugassi and McKinney, Rev. Sci. Inst. **13**, 335 (1942).

Surface Replicas for Electron Microscopy

LARS THOMASSEN, ROBLEY C. WILLIAMS, AND RALPH W. G. WYCKOFF
University of Michigan, Ann Arbor, Michigan

March 28, 1945

WE have recently developed a simplified technique for the preparation of replicas of surfaces for examination in the electron microscope. Heretofore, the most satisfactory replicas have been prepared either by forming a direct replica film of Formvar,[1] or by making a preliminary polystyrene cast, followed by the vacuum deposition of a silica film which is subsequently removed.[2] The former method is fast and convenient, but suffers from a serious lack of small-scale contrast and sharpness. The polystyrene method has the advantage of high contrast and sharpness, but suffers from the necessity of forming a preliminary cast of thermosetting material, and from the lack of an unequivocal interpretation of the details of the electron micrographs obtained.

We have found that excellent replicas can be made by the use of Formvar or collodion, followed by a shadow-cast film of chromium.[3] The replica, about 1000A thick, is first prepared in any of the usual ways, and is then placed in a vacuum chamber for the deposition of a chromium film on its impressed surface. The film is deposited at an angle from the normal whose tangent is about 4, and is made about 100A thick (computed). Figure 1 is a negative print of an electron micrograph of a Formvar-chromium replica taken from a chromium-nickel alloy, etched with a solution of copper sulphate in hydrochloric acid (Marble's reagent), and shadow-cast at an angle of 4 to 1. The regions which have been shadowed from the chromium vapor appear black, while those exposed most directly to the vapor appear white. The resultant picture is to be interpreted, then, as though the replica were observed by reflected light

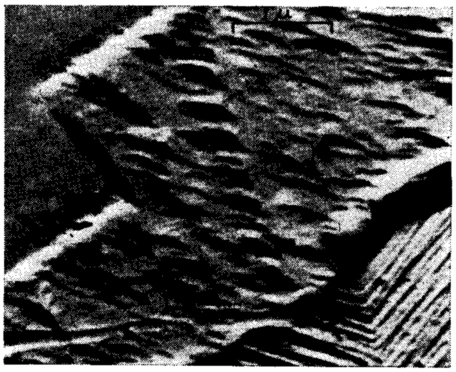

FIG. 1.

with oblique illumination. The original negatives show that sharply bounded relative elevations or depressions of 50A can be clearly measured.

[1] V. J. Schaefer and D. Harker, J. App. Phys. **13**, 427 (1942). V. J. Schaefer, Science **97**, 188 (1943).
[2] R. D. Heidenreich and V. G. Peck, J. App. Phys. **14**, 23 (1943).
[3] R. C. Williams and R. W. G. Wyckoff, J. App. Phys. **15**, 712 (1944).

New Materials

Forest K. Harris: Associate Editor in Charge of this Section
National Bureau of Standards, Washington, D. C.

Cold-setting Phenolic Resin Glue

A phenolic-resorcinol resin glue for wood bonding, which provides maximum water resistance for exterior plywood applications, is announced by Bakelite Corporation. It was specifically developed to meet demands for a cold-setting phenolic resin glue for the lamination of heavy lumber, beams, arches, and ship's timbers. It is also used for plywood glider fuselages, aircraft, and marine construction and meets the necessary specifications for this work, including Army Air Force Specification 14124.

A technical booklet *Bakelite Cold-setting Phenolic Resin Glue* XC-*17613*, written expressly to acquaint manufacturers with the properties of this newest of phenolic glues, is available from the manufacturer. This booklet explains formulations, mixing procedure, working life of glue, spreading, assembly, curing, cleaning, and storage. It is illustrated with graphs that show pot life, assembly times, and clamp periods. BAKELITE CORPORATION, *300 Madison Avenue, New York 17, New York.*

Fungicidal Coatings

The effects of fungus on electrical equipment exposed to tropical conditions constitute a very serious operational difficulty. It is important that toxicants used as preventatives, act before fungus has had an opportunity to colonize, as mold between electrical contacts may form a serious conductive path resulting from the high concentration of water and electrolytes in the cells of the fungi. If killed after attachment to a surface, the carbohydrates contained in mold structure have a tendency to form carbon paths. Many materials which are satisfactory fungicides have proven to be highly corrosive to metal, many are effective on only a few types of fungus, some volatilize under heat, and others leach out rapidly.

The Insl-X Company has extensively studied the problems of fungicides and of corrosion prevention for a considerable time. The fungicides developed in the laboratory have proven potent in extremely small concentrations, eliminating the danger to humans. *Insl-X No. 95-T* and *No. 85-T* are designed for the protection of phenolic parts which, through moisture absorption and fungus attack, have proven to be one of the danger spots of electrical equipment. *Insl-X No. 95-T* contains an extremely powerful fungicide which is, according to official reports, non-toxic to humans. It develops extraordinary adhesion to molded or laminated phenolic surfaces and is designed for waterproofing surfaces, cut ends, and punch holes regardless of the base plastic. It is applied by spraying or dipping followed by baking at 100°C. It may be used on all phenolics and melamines, also on generator and motor field coils and armatures. It is arc resistant, has a wet dielectric strength of over 1500 v.p.m., and a temperature range on phenolics of −55°C to 150°C. *Insl-X No. 85-IT* is a coating for phenolics similar to No. 95-T but is more flexible and has a temperature range from −55°C to 160°C.

Further information concerning these coatings and also other fungicidal materials may be obtained from the manufacturer. THE INSL-X COMPANY, *855 Meeker Avenue, Brooklyn 22, New York.*

Glass Development

A new glass for laboratory utensils, acid containers, safety goggles, and other purposes in which resistance against the action of hydrofluoric acid is essential has been developed in the laboratories of the American Optical Company. This glass contains no sand, the basis of all commercial glasses. Its major ingredient is phosphorous pentoxide, which by itself reacts violently with water. Chemical changes which take place in making glass make it less soluble in water than ordinary glass.

It is transparent and has melting and working properties much like ordinary glass. It can be cast or drawn into sheets or blown into bottles or other shapes. It can also be ground, polished, tempered, and subjected to other processes involved in glass technology without new equipment or technique. AMERICAN OPTICAL COMPANY, *Southbridge, Massachusetts.*