ACRYLIC PAINTS WITH ALKYD POLYESTER

LAMINATIONS AS A PAINTING TECHNIQUE

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The reason for this paper is to present a study of the compatability of alkyd polyesters and acrylic paints in a painting technique incorporating plastic laminations. A number of tests were conducted in order to discover the basic handling and visual characteristics of polyester in combination with acrylic paints. After the initial experiments, or "test plates," the information derived was applied to a series of demonstration paintings.

Polyester combined with acrylics in a painting technique has the advantages of excellent color intensification, the possibility of varigated textures, and a permanent bond between the support, ground, and painting medium.

Disadvantages of this painting technique include the unpleasant polyester odor, a long curing time required of the polyester, the need for unusual exactness in mixing catalyst with polyester resin, and the sticky, otherwise difficult nature of the polyester material. Once cured the polyester is unworkable, and the severe sensitivity of

polyester to temperature variations sometimes produces unexpected results. Considering the disadvantages of this painting technique, the artist may be forced to change his work method or style to an undesirable extent.

ACRYLIC PAINTS WITH ALKYD POLYESTER LAMINATIONS AS A PAINTING TECHNIQUE

THESIS

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CHAPTER I

INTRODUCTION

The Problem and Its Purpose

The research problem, which was the subject of this study, was intended to present some possible painting techniques using acrylic paints and alkyd polyester laminations simultaneously. An attempt was made to relate traditional painting forms to the more recently developed polyester materials. Part of the problem was to discover whether such a relationship was possible or not and the research included work which should have revealed any difficult handling qualities and might have led to other unknown characteristics.

The purpose of this problem was to explore a number of painting situations which might have led the artist to new approaches or techniques in his painting style and technique. This study was also a continuation of several years of working with acrylic paints which are also, as the polyesters, the result of research in plastics. The problem was a query into the practicality of handling and painting upon polyester laminations which may or may not contribute anything to the artist's painting approach.

Definition of Terms and Materials

Acrylic paint--A paint combining pigment with a polymer medium. Specifically the artist used "Liquitex Acrylic Polymer Emulsion Artists' Color." The colors selected were subjective choices while the values selected were based on a five-step value scale, white to black.

Alkyd--See Polyester.

Catalyst--A chemical which affects the speed of a reaction without taking part in the reaction itself. In this instance the catalyst was a peroxide acid. The catalyst was mixed with the polyester resin bringing about the final copolymerization.

Cure--The process of hardening a thermosetting resin by means of heat or a catalyst. Curing is also often times called "drying time" because the resin, once treated with the catalyst, changes from a liquid to a solid.

Ground--The layer or surface of paint applied directly to the support; also the surface which receives the acrylic paint, polyester lamination, or possibly a combination of both. The ground was latex paint or gesso. The Latex was of the following composition: Pigment--44 per cent (Titanium Dioxide--28 per cent, Aluminum Silicates--37 per cent, and Calcium Carbonates--35 per cent), and Vehicle--56 per cent (Butadiene Styrene Latex Emulsion--77 per cent, Non-Volatile Vehicle--18 per cent, and Tinting Color--5 per cent). The gesso was Duro Acrylic Gesso, an acrylic copolymer emulsion painting ground with white Titanium pigmentation.

Lamination--A layer or coat of polyester material; also, a material which consists of layers of polyester material bonded into one piece.

Polyester, Alkyd--The term encompassing polymers in which the main polymer backbones are formed by the esterification condensation of polyfunctional alcohols and acids. Polyester resins are thermosetting and, in their uncured state, are liquid, easily pigmented to a wide variety of colors, and are cured to a solid material by catalytic reaction which give off no liquids or gases during the curing process. The major application for polyester resins is in the production of reinforced plastics where they are used in conjunction with glass fiber and other reinforcing materials in the manufacture of mouldings such as boat hulls, car bodies, etc.--characterized by their toughness, weather resistance, and good weight/strength ratio.

Resin--Any of a large class of synthetic products usually of high molecular weight that bear some of the physical properties of natural resins but typically are very different chemically, that may be thermoplastic or thermosetting, and that are used chiefly as plastics or the essential ingredients of plastics.

Support--Any of the materials used to bear the ground materials. Supports may be of white pine wood, tempered masonite board, particle composition board, canvas board, galvanized sheet iron, or clear plexiglass sheet.

Thermoset--A plastic that softens once (during moulding) and which cannot be re-softened by heat.

Sources of Data

The initial sources of information for this study were book materials, periodical literature, and manufacturer's information. Sequential data were derived from experimentations and observations. Additional information was sought from knowledgeable persons who work with plastics.

Method of Procedure

The basic element common to all the initial experiments was the "plate." The plate was of various support materials cut into ten-inch by ten-inch squares and treated in a definite manner. There were seven test plates which were numbered sequentially. Each plate was treated in an identical manner as described in Chapter II. All plates were prepared at existing room temperatures and lighting conditions. One plate, number seven, was prepared for exposure to the varying temperatures and conditions found out-of-doors.

After the preparations and experiences of the test plates, a series of six demonstration plates of varying sizes were prepared which were based upon the information acquired from the test plates.

A written and illustrated summary of this study was prepared. The descriptive paper includes a review of the materials and techniques, photographs of the test plates and demonstration plates, and a statement of the conclusions arrived at after the completion of all the various plates.

Significance of the Problem

The presence of a new material in the history of art, especially in the history of painting, has frequently contributed to different forms, techniques, and styles of painting. For example, the introduction of oil painting into Italy during the 1400's affected the then popular fresco technique. The effect was similar to the impact of acrylic paints on traditional oil techniques popular today. The size of the painting surface, the color ranges, the covering ability, as well as the textural qualities change with each different medium. The use of polyesters may introduce such changes to contemporary painting.

Scientific investigation, industrial growth, business distribution methods, and an ever-expanding communications network have all contributed to the expanding list of new plastic materials which are easily available to the contemporary artist. These new plastic materials offer an especially fertile area for an artist's investigations. The modern chemist's discoveries and applications have presented literally thousands of varieties of unique plastic materials worthy of exploration.

In using acrylic polymer paints for several years, the following characteristics have become apparent: quick drying time, a good color variety and intensity, reasonable covering power, a wide spectrum between opaqueness and translucence, all of which comprise a very workable painting material. A plastic medium itself, acrylic paint might have proven to be an interesting companion for a wide variety of plastics. It was assumed that acrylic paints would combine with the gesso and latex grounds in a favorable manner.

CHAPTER II

THE TEST PLATES

The test plates were produced by pouring the prepared polyester onto the painted and unpainted surfaces of the ten-inch square plates. A "tape-frame" limited the liquid polyester's path to the ten inch square. The tape-frame is a band of masking tape extending approximately a half-inch above the plate's surface and enclosing the entire ten-inch square. (See Figure 1.) The tape-frame is removed from the plate after the polyester has cured.

Fig. 1--Tape-frame around test plate

The test plate is, as mentioned above, ten inches square. The plate is subdivided into four equal quadrants, five inches by five inches. Each quadrant is designated by a letter: A, B, C, or D. (See Figure 2.)

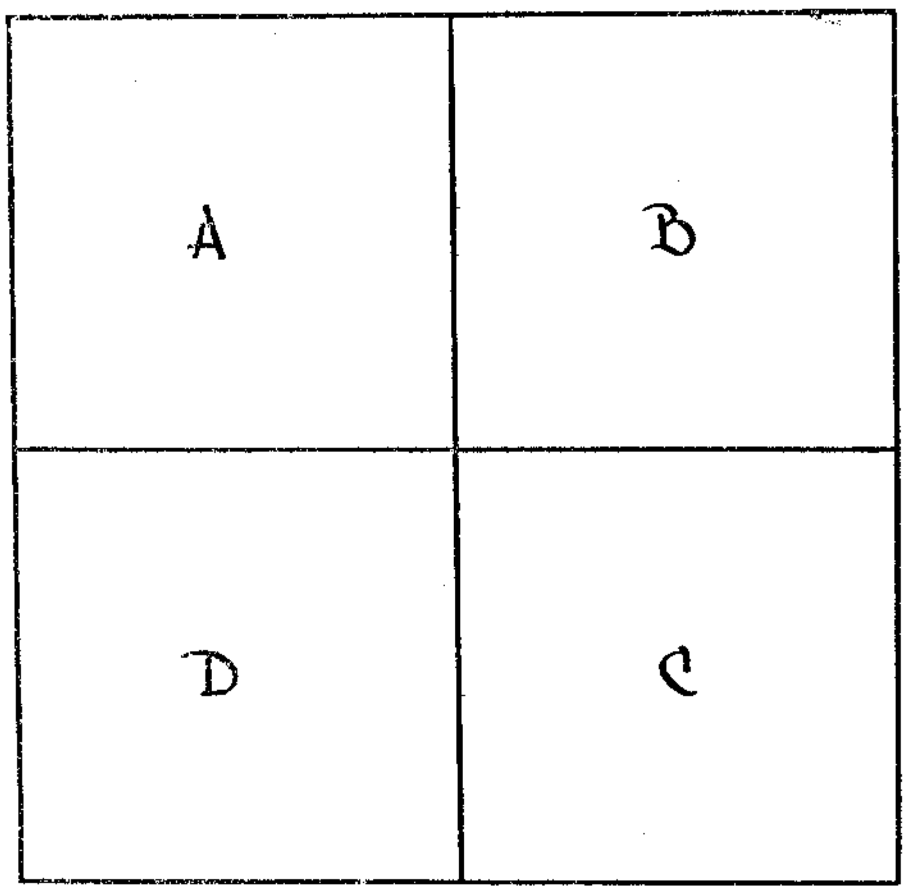

Fig. 2--Test plate design with quadrant designations

Quadrant A, the upper left-hand corner of the test plate, is subdivided into two areas. Area 1 is the untreated support material. Area 2 is the support material with a polyester lamination. (See Figure 3.) Masking tape is used to limit the flow of the polyester liquid to the designated areas.

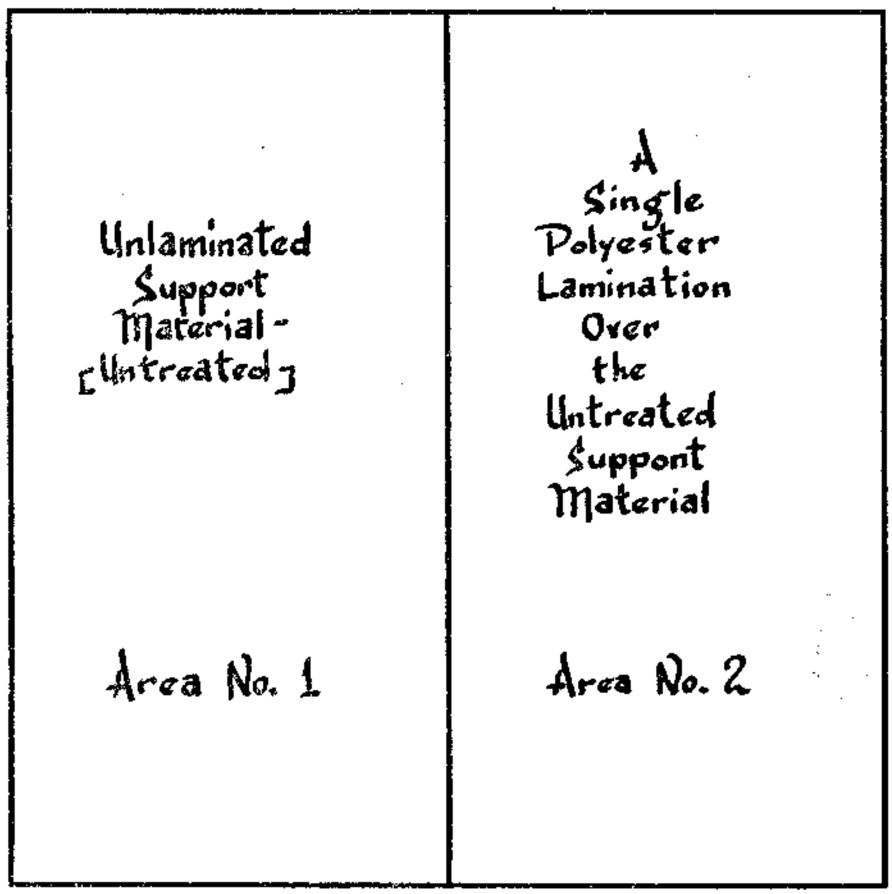

Fig. 3--Test plate--quadrant A

Quadrant B, the upper right-hand corner of the test plate, is subdivided into two areas. Area 3 is the support material painted with a white acrylic gesso ground plus a polyester lamination over the ground. Area 4 is the support material painted with a light gray latex ground plus a polyester lamination over the ground. (See Figure 4.)

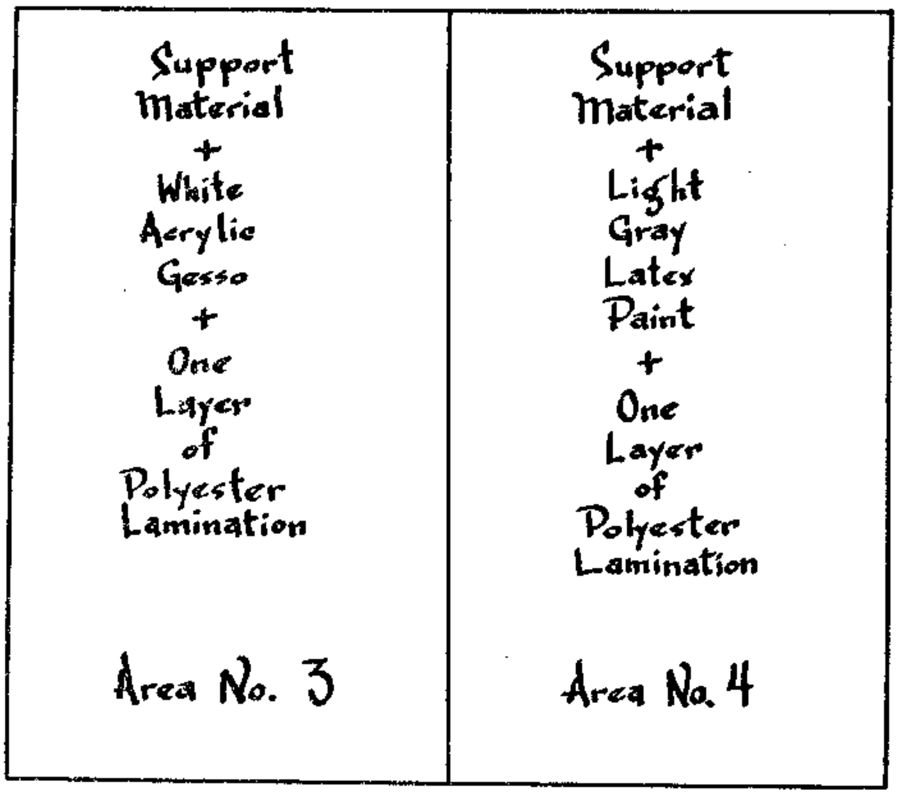

Fig. 4--Test plate--quadrant B

Quadrant C, the lower right-hand corner of the test plate, is subdivided into two areas. Area 5 is the support material painted with a white acrylic gesso ground, a series of acrylic values and colors, and finally, a polyester lamination. Area 6 is identical to Area 5 except that the ground is light gray latex in place of the white acrylic gesso ground. (See Figure 5.)

Fig. 5--Test plate--quadrant C

Quadrant D, the lower left-hand corner of the test plate, is subdivided into areas. Area 7 is identical to Area 5, with a further addition of a series of transparent and opaque acrylic paints covered by a polyester lamination.

Area 8 is identical to Area 6, with a further addition of a series of transparent and opaque acrylic paints covered by a polyester lamination. (See Figure 6.)

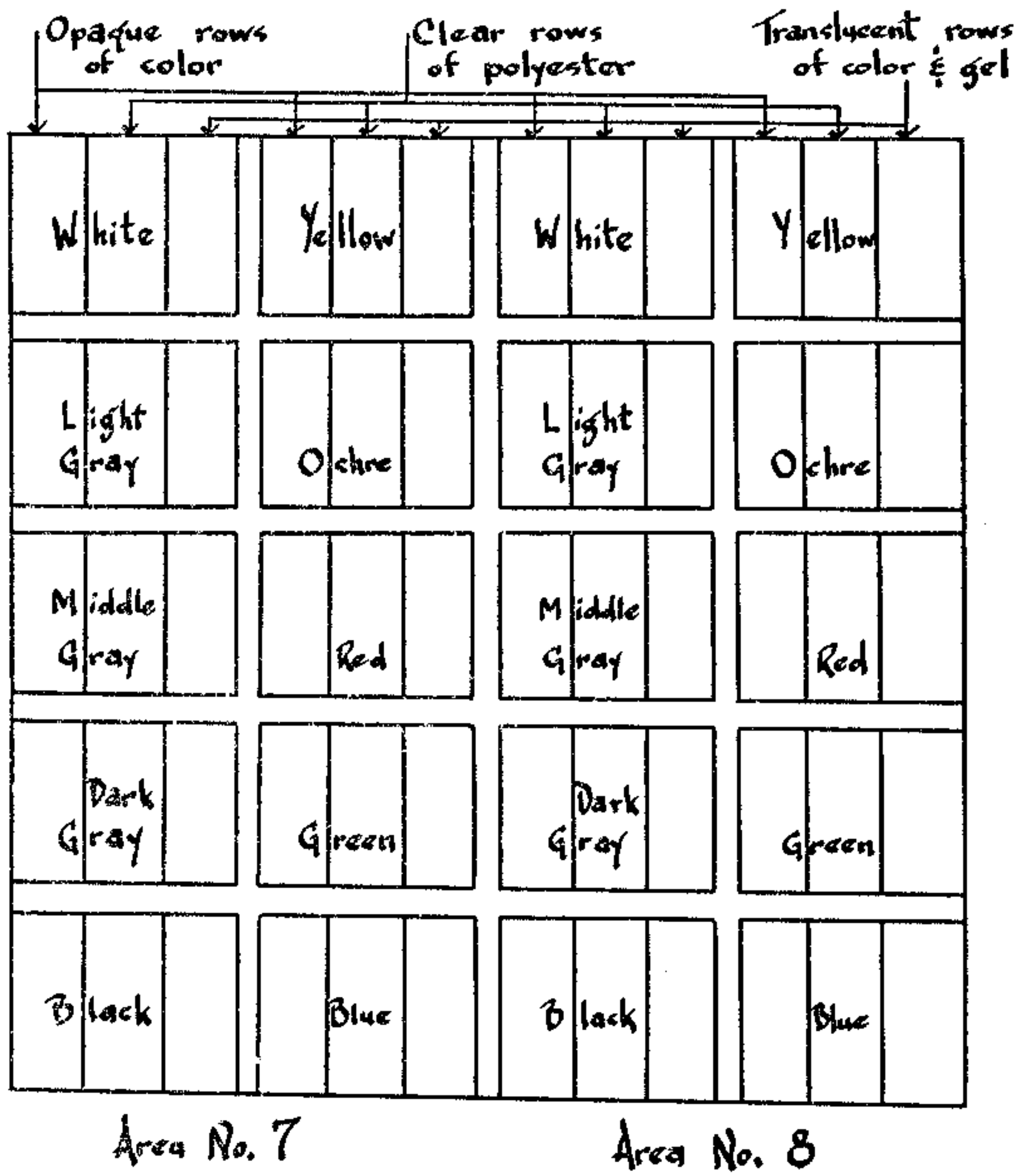

Fig. 6--Test plate--quadrant D

Six different support materials were used: white pine wood, tempered masonite board, wood particle composition board, canvas board, galvanized sheet iron, and clear plexiglass sheet.

The test plates were numbered in numerical order, one to seven. Test plate numbers one and seven used a white pine wood support. Test plate number seven was placed out-of-doors. (See Figure 7.)

Fig. 7--Completed out-of-doors test plate

Test plate number two used a tempered masonite support. Test plate three used a wood particle composition board support. Test plate four used a canvas board support. Test plate five used a galvanized sheet iron support. And test plate six used a clear plexiglass support. (See Figure 8 for a photograph of the completed test plates.)

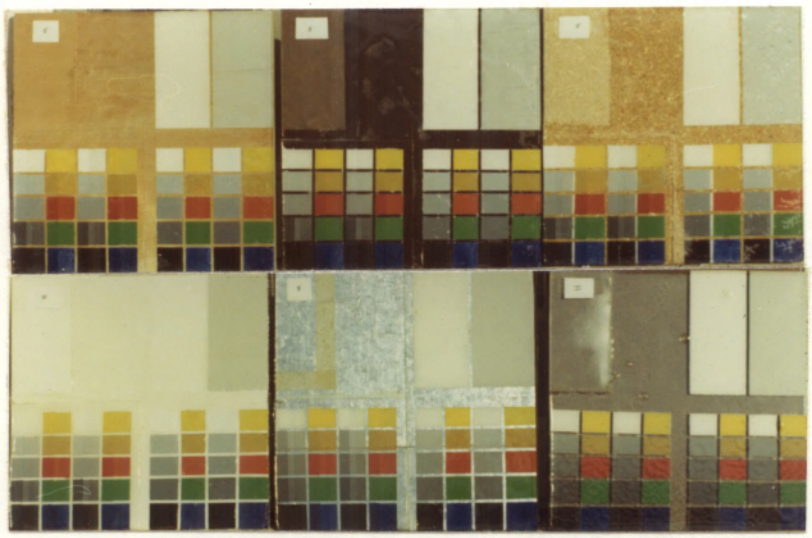

Fig. 8--Completed test plates

General results and observations are mentioned in Chapter IV (Conclusions). The test plates were successful with regard to the bonding between the supports, grounds, acrylic paints, and polyester laminations. The thin laminations were easily controlled by tape barriers, both on the edges and the surfaces. If the laminations are kept thin, there is no apparent need for more elaborate wood or metal retaining devices.

Of special interest are the textural variations on each plate. These are due, in part, to the varying thicknesses of the laminations. They are also due to the different surface qualities of the supports, grounds, and acrylic paint.

Slight color variations may be noted on some plates in the Quadrant A areas. The polyester seems to darken some of the support materials, especially test plates one, two, three, and four.

The out-of-doors plate, number seven, survived several months of exposure with no severe difficulty. The unlaminated part, Area 1, was the only area which is quite different from test plate one, Area 1. Both test plate one and seven utilize a wood support.

CHAPTER III

THE DEMONSTRATION PLATES

The demonstration plates represent a departure from the test plates. A number of unexpected reactions occurred in the preparation of the test plates and a few appeared to be worthy of further exploration. Chapter IV (Conclusions) mentions the several variations not mentioned in the literature, but the discovery of such unknown characteristics was one purpose of this study.

The liquid nature of polyester obviated any attempt to keep the material within a hard-edge style. Only the taping techniques, such as those employed on the test plates and also utilized on all the demonstration plates, seemed to work with any consistency. Tape and cut paper were included successfully as design elements in several demonstration plates, two and five.

The effect of room temperatures on these plates was especially unexpected. When the temperature was above ninety degrees, as it was for several weeks, the polyester refused to react in a predictable manner. The material set up too rapidly and the laminates separated from one another.

There were also some separations between the laminates and the supports and grounds, as in demonstration plates three and four. In cases where these unusual responses may be controlled, new styles and forms are possible.

The addition of an extra amount of catalyst to the polyester resin forces the material to cure rapidly. Again, this idiosyncrasy may be utilized to produce unusual textures, and this occurrence may be controlled with some accuracy.

Following are photographs of the individual demonstration plates with explanations of procedures and other observations.

Two laminations were used on plate number one. One was applied in an abstract pattern on the masonite support and another lamination covers the entire plate. The various paints were brushed and wiped over the first abstract lamination. In other words, the initial lamination was applied to a limited area of the support, the area when covered with gesso and painted, was then covered with the second polyester lamination. (See Figure 9.)

Cut paper forms, painted with acrylics, were used to produce plate number two in a hard edge style. The paper forms are opaque materials. The purity of the polyester

Fig. 9--Demonstration plate number 1

resin is especially important in this application. The resin may be strained through cheese-cloth, or any finely woven material, in order to insure its purity. (See Figure 10.)

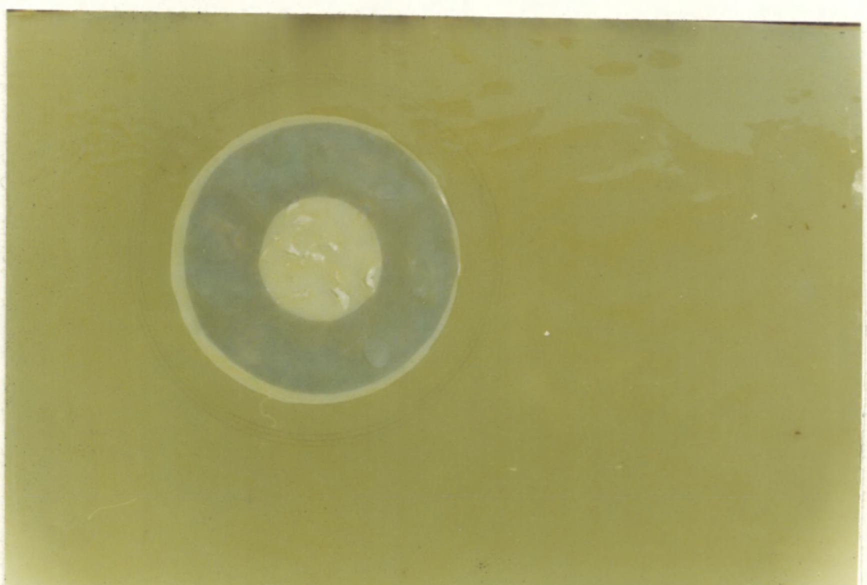

Fig. 10--Demonstration plate number 2

Demonstration plate number three was poured on a day when the temperature was over ninety degrees. The support was placed in a flat position to enable the pouring of all laminations to an even thickness. One edge of this combination unexpectedly pulled away from the acrylic paint. Such an unintentional occurrence was one of the surprising reactions possible with this most unusual substance. The color intensification of the Napthol Red on the Yellow-gold background is especially strong. (See Figure 11.)

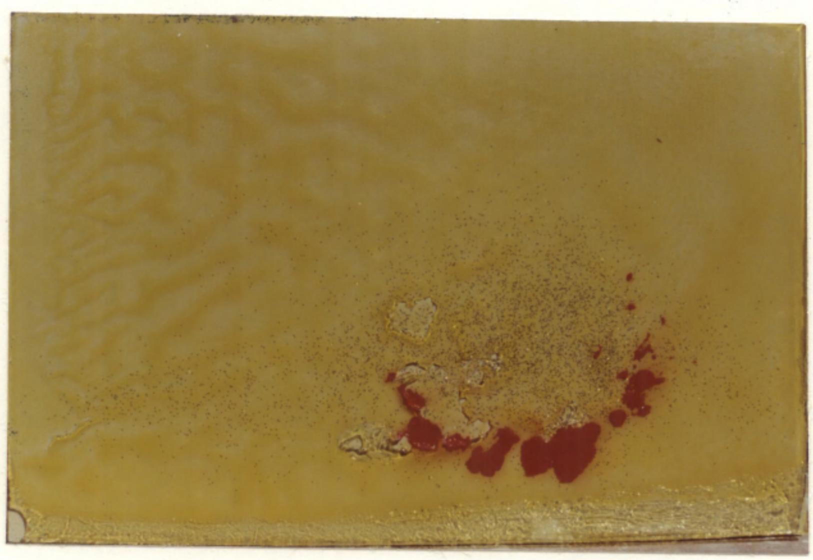

Fig. 11--Demonstration plate number 3

Seven layers of lamination compose plate number four, which takes on a three-dimensional form physically as well as visually. Severe, high temperatures forced several layers apart so that pigment and polyester moved freely during the last three laminations to produce a three-dimensional appearance. The interesting textures produced by these separations also represent some structural weaknesses in the finished plate. (See Figure 12.)

Fig. 12--Demonstration plate number 4

On plate five, a particle board plate, taped linear techniques are employed in addition to inked lines. The four laminations are very similar to the flat laminations aimed for in all the test plates. The blue background appears as three separate levels but holds together visually none-the-less. Demonstration plate number five is similar in treatment to Figure 8 because it contains sections of taped lines in addition to drawn lines. (See Figure 13.)

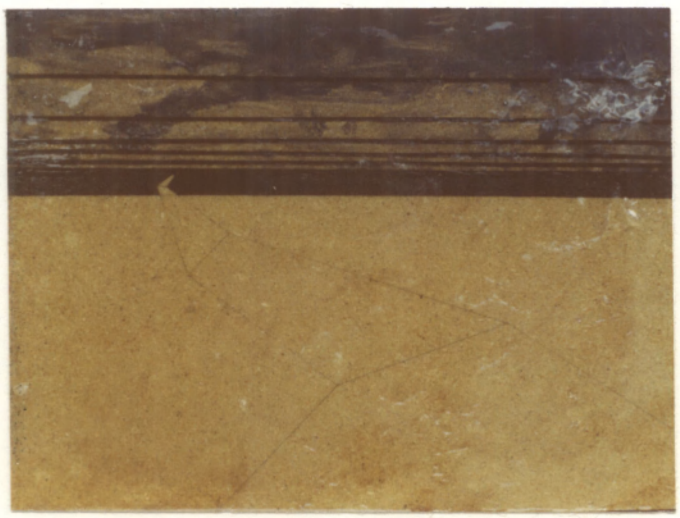

Fig. 13--Demonstration plate number 5

The masonite support of demonstration plate number six of four laminations contains painted line work, a commercial metallic dust often used as decorative material on package wrappings, and polyester with an unusual amount of catalyst which causes it to cure at a very rapid rate. The metallic dust sprinkled on the top of the last polyester lamination, while it was still liquid, settled into the polyester well enough to be bonded to this top surface. Although the painted lines were meant to follow a tape barrier, the irregular surface caused some paint to flow under the tape. (See Figure 14.)

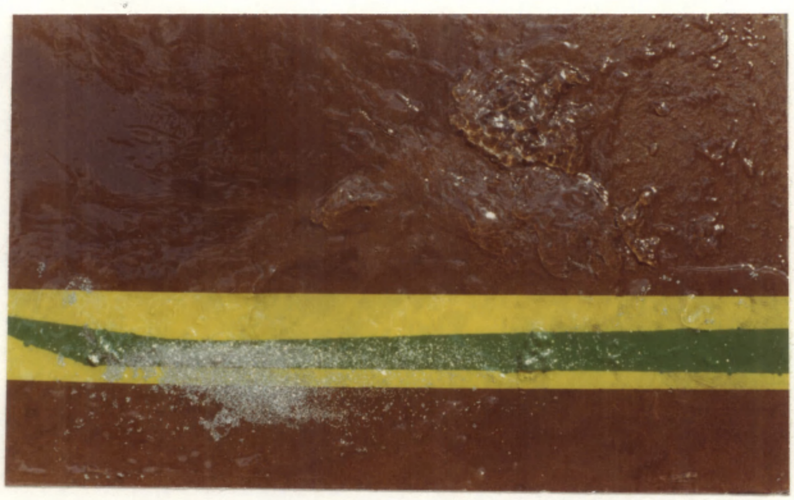

Fig. 14--Demonstration plate number 6

CHAPTER IV

CONCLUSIONS

The results of this research confirmed several earlier assumptions, but the results also presented a number of unique and unexpected polyester characteristics.

The selection of a high quality polyester has proven to be very important. Currently there are over twenty-eight different types of polyesters on the retail market. One indicator of the polyester's quality is its cost per unit. For example, low quality polyesters, those which bear a yellow tint after drying, may sell for $3.00 per gallon, while high quality, clear-drying polyester sells for $10.00 per gallon.

Cost alone is not a complete indicator of high quality polyesters. Recently purchased polyester should be tested for its actual quality. A small sample, regardless of cost or labeling, should be mixed, poured, allowed to cure, and then checked for clearness. Severe temperature changes, impurities, and variations in manufacture all contribute to quality variations.

Preparation of polyester is another area of concern to the artist. Polyester is prepared by mixing a specific quantity of catalyst to a given quantity of polyester. The curing time of the polyester is directly related to the ratio of the amount of catalyst to the amount of polyester so that an increase in the amount of catalyst cures the same amount of polyester at a faster rate. Too much catalyst will congeal the resin into an uncontrollable, jelly-like mass.

Regardless of the catalyst-to-resin ratio, if the room temperature is over ninety degrees the mixture of catalyst and resin may never cure completely. The mixture will remain a distorted, unresolved compound.

Assuming the polyester material is prepared correctly in a moderate temperature, there is another occurrence which involves the surface of the cured lamination. Polyester will cure completely only in the absence of atmosphere. Therefore, only the polyester material below the exposed surface cures out. There remains a thin, sticky film of uncured material over the lamination's surface. This film will not cure until a very thin sprayed coating of polyvinyl alcohol (PVA) is applied. The PVA seals the sticky surface from the air, thus allowing the entire thickness to cure throughly.

The PVA is transparent and dries quickly so that nothing else need be done to finish the last lamination layer.

PVA may or may not be applied to sub-surface laminations depending on the artist's choice. A sequential lamination usually seals everything beneath it, however a coat of PVA may be applied in cases where surface consistency is especially significant, or in detailed or hard edge work.

Another characteristic of polyester which makes it difficult to work with is its severe odor. The literature on polyester, as well as manufacturer's guides, all mention the need for a fresh-air working environment. Not only is the smell of polyester foul, but if the fumes are breathed in great quantity, it may be extremely hazardous to one's health. The most reasonable work routine is established in an open garage where the resin and catalyst is mixed, poured, and allowed to cure in the absence of the artist.

Once the catalyst is mixed with the resin, curing begins immediately. The artist must plan for the lamination before he combines the ingredients. The mixture should be poured directly after it is mixed. If this is not done small "clots" of polyester will form in the liquid and possibly mar an otherwise smooth surface. But the main difficulty is that the artist has little, if any, control over the mixture once the catalyst is added. His control is limited to the proportion of catalyst he adds to a quantity of resin. Once the material is poured he can not control the polyester other than diverting the flow of the polyester over the surface.

In its liquid form, polyester is especially difficult to control. Even in a basically two-dimensional painting each lamination, once poured, should not be touched until it is cured. As the liquid polyester is very sticky, and is not easily removed from anything it touches, it is a particularly cumbrous material to use.

The cured polyester is a solid material. Because it is so tough, alteration is impossible other than by cutting or drilling into the material. Any foreign materials (insects, hair, leaves, air bubbles) or pieces of set polyester will be embedded in the polyester when it cures. Materials may be removed while the polyester is liquid, but if something enters into the polyester during its long curing time without the artist's knowledge it may ruin the project.

The curing time of the polyester is a great handicap to most artists. A minimum of four hours curing time is advised by the manufacturers but, in the course of this study, neither test plates nor demonstration plates ever cured in that time. Between six and twelve hours was usually required before further work could be accomplished.

The long curing time coupled with the other limitations of polyester material supports the idea of careful planning on the artist's part. Changes and controls are scarcely existent for the artist using polyester.

The beneficial characteristics of polyester with acrylic paints as a painting technique seem limited. The durability of polyesters has been shown elsewhere. A painting's permanence should be increased significantly by the inclusion of polyester laminations; the enveloping quality of this material seals anything it surrounds so that deterioration as the result of atmospheric conditions is greatly reduced, if it is not eliminated completely.

Another point worthy of mention is the intensification of color occurring from superimposition of a polyester lamination over acrylic paints. This "wet" look is characteristic of transparent surfaces over colored surfaces, and the optical changes which occur may or may not be desirable.

In summary, polyester incorporated in a painting technique is an advantageous material because of its unusual permanence, textural varieties, and color intensification characteristics. Permanence is excellent when thin laminations are utilized. As long as the polyester remains in a liquid state it may be shaped and textured, and the intensification of color brought about by the polyester remains permanent unless distorted or dulled by the introduction of foreign materials.

The disadvantageous characteristics of polyester as a painting material include its unbearable odor and prolonged drying time. The sticky quality of polyester in liquid form and the extreme hardness of it in cured form present control difficulties. Polyester reacts in preparation and curing to changes in temperature, and the combination of resin with catalyst requires of the artist special attention to the quantities of each material. Of special concern to the artist, polyester used as a painting material may unduly complicate or otherwise modify the artist's painting style and technique.

In weighing the advantages and disadvantages of polyester as a painting material, it appears the polyester has too many distracting or uncontrollable qualities to allow it to be used as a general painting material. But this should not deter further exploration of other plastics as possible painting media. This research problem did not include the use of dyes and tints available for coloring the otherwise clear polyester resin. Nor did the study investigate the possible relationships of polyester with other plastic resins, such as polystyrene, polyurethane, or other thermosetting resins. Possible painting media and techniques may also exist in thermoplastics. Thermoplastics respond to re-heating and could be manipulated where polyesters could not. The emphasis of this research problem, while eventually pointing out the negative qualities of polyester as a painting material, also establishes a base from which the painter may go on to explore the broad span of plastic materials.

BIBLIOGRAPHY

Books

DeJong, Casper, _Paintings of the Western World_, Translated by Hans Koningsberger, New York, Barnes & Noble, Inc., 1963.

Doerner, May, _The Materials of the Artist and Their Use in Painting with Notes on the Techniques of the Old Masters_, Translated by Eugen Neuhaus, New York, Harcourt, Brace, and Co., 1934.

Gutierréz, Jose and Nicholas Roukes, _Painting With Acrylics_, New York, Watson-Guptill Publications, 1965.

Jensen, Lawrence N., _Synthetic Painting Media_, Englewood Cliffs, N. J., Prentice-Hall, Inc., 1964.

Lappin, Alvin R., _Plastics Projects and Techniques_, Bloomington, Illinois, McKnight & McKnight Publishing Co., 1965.

Laurie, A. P., _The Painter's Methods & Materials_, New York, Dover Publications, Inc., 1960, 1967.

Mayer, Ralph, _The Artist's Handbook of Materials and Techniques_ (3rd ed.) New York, The Viking Press, 1970.

Newman, Thelma R., _Plastics As An Art Form_, Philadelphia, Chilton Books, 1964.

Articles

Berl, Kenneth, "Combining Enamels and Plastics," _Ceramics_, 17 (May, 1969), 23.

"Design: the Expanding World of Polystyrene Foam," _Architecural Design_, 40 (August, 1970), 417.

McQuode, William, "Encasement Lies in Wait for All of Us," Architectural Forum, 127 (November, 1967), 92.

Malone, Ralph, "Plastics as Plastics," Design, 241 (January, 1969), 22-28.

"Plastics as Plastics," Interior Design, 40 (Jaunary, 1969), 105-107.

"Plastics on the Go," Industrial Design, 16 (July, 1969), 74-75.

Smith, Paul J., "Plastics as Plastic: I and II," Art and Artists, 4 (July, 1969), 36-39.