LEAD INDUSTRIES ASSOCIATION

60 EAST 42nd STREET

NEW YORK 17, N. Y.

July 30, 1959

TO: All Members of the Chemical Subcommittee and the Pigments Technical Committee of the Lead Industries Association

Gentlemen:

Attached herewith is a copy of a proposal submitted by Dr. Max Kronstein of the College of Engineering, New York University. This proposal would be a fundamental investigation of "The Interreaction of Pigmented Coatings with Metal Substrate". As submitted to us the proposal is for a period of one year at a cost of $16,500 per year. At the present time we do not have adequate funds to cover this proposed research in 1959, however, I think we should consider this proposal on three bases. One, its value to the industry as a fundamental study of how we may improve and evaluate our paints and to improve the bonding characteristics with a substrate. Two, whether this should be included in the 1960 budget. Three, whether the sum of $16,500 is satisfactory or is excessive for the problem involved.

Unfortunately, the paint field is not one of my star fields and, therefore, I would like to rely completely on the Committee for their comments and suggestions.

I do feel it is imperative to advise these people at the earliest possible date what our decision will be, therefore, I should appreciate hearing from you by 7 August so that I may advise Dean Work. Obviously, this will involve their student fellowships for the academic year 1959-1960 and they should know at the earliest possible date.

With kindest regards and sincerest appreciation for your help in this regard, I remain

Sincerely yours,

HFR:mp
Attachment

COPY

PROPOSAL FOR A RESEARCH PROJECT ON THE INTERREACTION BETWEEN PIGMENTED COATINGS AND THE METAL SUBSTRATE TO WHICH THEY ARE APPLIED

It is a general practice to refer to inert and to reactive inorganic pigments; whereby white lead, red lead, zinc chromate and others represent the group of reactive pigments, and such materials as titanium dioxides, iron oxides and extender pigments represent the group of non-reactive pigments. The term reactive pigments has generally referred to the chemical reactivity between the pigment and the organic vehicle with which it has been compounded, especially oils; and the formation of metalsoap-like compounds has been seen as the primary form of reaction.

The proposed project would study the reactive pigments with respect to the interreaction between paints compounded with the reactive pigments and the metal substrate to which they have been applied. In a recent paper by this research group (paper entitled "Reactive Coatings" given by Dr. Kronstein at Northeast Regional Corrosion Conference, N.A.C.E., in Boston, October 7, 1958.) ways and means have been shown for studying the chemical changes which occur on a steel surface to which chemical coatings have been applied. It was shown, for instance, that a phosphatized steel surface can change chemically after the application of a paint based on a reactive pigment, such as zinc chromate; and it is assumed that red lead would react in a similar manner. Hereby, metal of the pigment becomes part of the phosphate coating underneath the applied paint. For example a phosphatized steel surface which in a spectroanalysis did not contain any zinc, contained 3.55% zinc after the application and removal of the paint. The 3.55% zinc could only have entered from the zinc chromate in the paint. It is apparent that such a reaction could be of basic practical importance if it could be established that in the same manner a red lead primer would introduce lead into the coated surface to further inhibit the surface corrosion. An inert pigment would not be able to do this.

The reason why the reported test had been applied to a pretreated, or phosphatized surface, was in the fact that it is easier to remove such a pretreatment and analyse it for its components. The method which has been used by this research group to determine whether or not an interreaction has occurred between an applied coating and its substrate consists of chemically dissolving the surface treatment and analyzing the resulting solution by emission spectroscopy. This has been described in a paper by Dr. Kronstein, Sheldon Kase and J. E. Van Dien entitled "Phosphatizing Reactions on Steel", which has been published in a magazine "Paint and Varnish Production", Vol. 47, No. 12, November 1957. Further facts to this kind of analytical work have been given in a paper entitled "Studying Organic Coatings-Using Infrared Reflection Spectrum and Emission Spectroscopy" by Dr. Kronstein. This paper has been published in "Paint and Varnish Production", Vol. 49, No. 1, January 1959.

Since it is possible to analyse an applied and stripped phosphatization, it is also possible to study the changes which occur at the metal-paint interface, due to the application of the reactive

pigment in a dispersion in an organic vehicle. An example of a paint form which has been studied with respect to its interreaction with a steel surface is the wash-primer on bare steel. Here, the zinc oxychromate and the phosphoric acid dissolved in the paint result in the formation of an iron-zinc-phosphate coating on the steel. It is the feeling of the undersigned that similar reactions occur in the case of red lead primer applications also, and they might occur also when a basic lead carbonate paint would be applied directly to a steel surface.

The proposed project would study the following:

(1) the interreaction of reactive pigment dispersions in selected vehicles with a clean, bare, steel surface.

(2) the same on chemically pretreated surfaces.

(3) the same on surfaces which have a coating of an oxide or hydroxide or a slight form of rust.

This interreaction is (a) to be established and analyzed; and (b) its effect on the stability or corrosion resistance of the metal surface is to be studied. In the studies to "b", comparative studies on unpainted steel surfaces are to be made also and on surfaces which are painted with a paint which does not contain any reactive pigments.

As the interreaction is further studied and established a second question will have to be taken up; that is, is the interreaction product an inorganic compound only, or have certain organic media become chemically a part of the lead-iron complexes or the zinc-iron complexes on the surface? That, for instance, lead is capable of forming a great number of complexes with inorganic and with organic groups is known in the literature. The project is planning to use such selected organic vehicles with the reactive pigments as can be expected to contribute to the formation of metal complexes with the steel, aluminum or magnesium surface. The organics in the complexes, which are being formed directly on the steel surface, would be different from the heavier paint film which is being formed on top of the reaction coating due to the drying of the paint itself.

That a chemical formation on a steel surface can have considerable influence on the stability of the surface was studied some years ago by this research group in the case of surface treatments on magnesium metal surfaces. The results were reported in two papers to the American Chemical Society, which were later published in "Paint and Varnish Production". ("Surface Availability of Inhibitors in Protective Coating Systems" Part I- Dichromate Treatment of Magnesium Surfaces, by Max Kronstein and Joseph C. Pettorino, in Vol. 46, No. 12, November 1956; Part II Chromate Pigmentation of Organic Coatings, by Max Kronstein and H. F. Hammerle, in Vol. 46, No. 13, December 1956). In these papers the effect of chromates as the reactive pigment was studied. The proposed project would study to what extent other groups of reactive pigments can produce inhibitor layers on the metal surface and how such modifications stand up under exposure to moisture and chemical effects.

The proposed work would be carried out in the Surface Technology Laboratory of the Research Division, College of Engineering, New York University, under the direction of Dr. Max Kronstein as project director. This laboratory is now located in Research Building No. 2, 401 West 205th Street, New York 34, New York; but it is scheduled to be relocated in Research Building No. 3, Major Deegan Highway and Fordham Landing Road, New York 68, New York, in the Fall of 1959.

The project director would be assisted by one full-time chemist or Chemical Engineer (Research Aide) and additional student assistance as it might be required. The part-time services of an assistant research scientist would be used in the coordination and recording of the work. The emission spectroanalyses would be done jointly with Mr. J. E. Van Dien at the Applied Spectrochemical Laboratories, Inc. in Glen Rock, New Jersey.

Respectfully submitted,

June 22, 1959

/s/ Max Kronstein
Senior Research Scientist

Approved:
/s/ Harold K. Work
Associate Dean
Director, Research Division

COPY

New York University
College of Engineering
University Heights, New York 53, New York

COST SCHEDULE

(1 YEAR BASIS)

Salaries:

Project Director (20% of time)	1,800.00	
Research Aide (100% of time)	4,000.00	
Student Assistance, as required. (720 hrs/1.30/hr.)	936.00	
Assistant Engineering Scientist (20% of time)	1,044.00	
Mechanic, draftsman, as required.	220.00	
	$8,000.00	$8,000.00
Overhead (57% of salaries)		4,560.00
Materials and Supplies		2,800.00
Reports, photographic work		200.00
O.A.S.I. (2.5% of wages)		200.00
Tuition Remission		540.00
Communication, travel		200.00
		$16,500.00

June 22, 1959