Comments and Communications

Phosphate Coating of Aluminum and Polymorphism of Chromium Phosphate

Articles of aluminum are usually treated by a process called bonderization or Parkerization to form a thin protective layer on the surface which gives an electrical and heat insulating coating and constitutes a good base for paint or other finishes. A recently developed method for coating aluminum is to treat the surface of the metal with a chromic acid and phosphate solution (R. C. Gibson and W. C. Russell. *Ind. eng. Chem.*, 1946, 38, 1222; C. H. Horace. Brit. Patent 398,180; J. S. Thompson. U. S. Patent 2,234,206). One sample of such a coating, light green in color, shows the following composition upon chemical analysis: coating weight, 160 mg/sq ft of surface area; Cr, 14.5%; Al, 9.8%; PO_4, 32.7%; F, 7.5%.

TABLE 1

Form	Description	Hydrate	X-ray powder method results
(I)	Light violet, freshly precipitated in cold	6	Characteristic pattern
(II)	Violet crystal transformed from (I)	6	Characteristic pattern
(III)	Green crystal transformed from (II) by heating in water	4	Diffraction pattern same as (II)
(IV)	Green crystal transformed from (II) by heating in glacial acetic acid	4	Diffraction pattern same as (II)
(V)	Fresh precipitate formed in hot solution	Not const.	No dif. pattern
(VI)	Green crystal by heating (II), (III), and (IV) at 120°	2	No dif. pattern
(VII)	Black residue obtained by igniting the above forms	0	No dif. pattern

X-ray diffraction analysis with chromium Kα radiation has been used to identify compounds present in this coating. Most of the lines correspond with those for pure aluminum phosphate prepared by mixing equivalent amounts of aluminum chloride and phosphoric acid and heating the mixture over a small flame of a Bunsen burner until no more fumes of hydrogen chloride were detectable. This pattern is entirely different from the one listed for aluminum phosphate in the ASTM Card Index. A whole series of aluminum phosphates representing polymorphism, various hydrates, and phosphoric acid forms has been found. Additional lines in the above pattern correspond to aluminum oxide and aluminum fluoride, but the chromium phosphate producing the green color is evidently amorphous. In an effort to identify this, an intensive investigation of chromium phosphates has been made, with the results shown in Table 1.

The most interesting facts are the dimorphism of the hexahydrate; identity in crystalline structure of the tetrahydrate with the hexahydrate, indicating that 2 of the 6 water molecules in the violet crystal must be zeolitic; and the amorphous nature of the compounds below the tetrahydrate. This behavior together with changes on heating indicate the presence of green chromium phosphate dihydrate on the protective coating in aluminum.

G. L. Clark and A. P. Tai

University of Illinois

National Science Foundation—A Peril to American Universities

Alluring as it may be, the prospect of easy and abundant Federal money for the promotion of science in universities through research grants and through contracts for research to be done for the Government seems to me to hold many perils to the freedom of the universities and to scientific education.

The first peril is that the National Science Foundation itself will be controlled by politicians rather than by scientists and that therefore the management may not always be in the hands of men whose first interest is the welfare of science, education, or educational institutions. According to the bill as now proposed, the 24 members of the Foundation, as well as its director, would be appointed by the President. Politics would inevitably play a part in such appointments. Scientists might offer advice and be consulted, but there seems to be no assurance that their advice would be heeded.

A second peril is that the director of the Foundation, because of his power to grant or to withhold research funds, would come to exercise a very real control of university policies and scientific activities. It would be naive to suppose that the agency supplying the funds would long continue to appropriate large sums over which it did not have definite control, both as to expenditure and as to the research projects to be paid for by those funds.

The allotment of research funds to universities would cause competition among them, and the funds would naturally go to the larger institutions best equipped to make good use of them. These would become even larger, and research and educational opportunities would be still further concentrated, to the detriment of the smaller institutions.

In the competition for grants, the general policies of the universities would necessarily be subject to strong pressure toward control by the Federal agency making the grants, for the university administration which is compliant and politically adept might reasonably expect to have its grants continued or increased, while the administration which is recalcitrant in any way might expect to be slighted.

Research grants for anything other than very temporary projects would create vested interests in space and personnel which would exert still more powerful