surface of the deposited lead was formed in the concave lead mirror, so that the scattered light was observed as though it had an "absolutely black" body for its background. With the aid of the lens D and the pivoted mirror M, the image of the sample was projected on the slit of the spectrograph C, so that the scattered light passed through the resonant filter F, located in the furnace P. In order to prevent fogging of the flask from the freezing-out of air when the apparatus was cooled with liquid helium, the interior of the tube T was evacuated to a pressure of $\sim 10^{-3}$ mm Hg, and the remaining gas adsorbed by cold activated charcoal u. The spectrum of the light scattered by the sample was observed visually and also registered photographically on RF-3 X-ray film, which had been shown to be the most sensitive for the D-line.

Three experiments were carried out with exposures of 4, 11, and 12 hours. In visual examination of the scattered light, or in these photographs, no satellites were observed in the region of the D-doublet. Comparison of the exposures used in this experiment with those required in order to obtain noticeable blackening from light of intensity I_0 scattered by a mat white surface shows that a satellite of intensity $\sim 10^{-7} I_0$ could have been detected.

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Glow of Aluminum Alloys in an Electrolytic Bath

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IT is well known that aluminum and its alloys have protective oxide coatings on their surface, which prevent the penetration of oxygen into the interior of the metal. Much research[1-4] has been devoted to studies of the structure and properties of such oxide layers, in which the physical-chemical properties of the anticorrosive layers on aluminum have been studied rather thoroughly.

This paper presents a series of qualitative observations which reveal yet another feature, associated with the production of oxide films and their structure, namely the ability of aluminum and its alloys to glow under the action of an electric current in solutions of certain salts and bases.

The experimental arrangement for observation of the phenomenon of the glowing of electrodes in solutions of electrolytes during the passage of an electric current consisted of a bath containing the electrolyte and the electrodes. Alternating current was supplied from the line at 220v and direct current was supplied by a vacuum tube rectifier. Samples in the form of plates 50 mm × 30 mm × 1 mm and 60 mm × 70 mm × 1 mm were used as electrodes. The following materials were tested: copper, bronze, brass, lead, zinc, iron, silver, aluminum and its alloys AM, AMZ, D-1, D-16, "electron", "silumin" and others.

The following materials were used as electrolytes: 1-10% solutions of the salts: NaCl, NaBr, KCl, $NaHCO_3$, Na_2CO_3, NH_4Cl, $MgSO_4$, $(NH_4)_2SO_4$ Na_2SO_4, K_2SO_4, $KAl(SO_4)_2$, Na_2HPO_4, Na_3PO_4, $CaHPO_4$ and also 0.1-5% solutions of the bases NaOH, KOH and others.

During the observations, the potential drop between the terminals of the bath was read to an accuracy of 1v, while readings of the bath temperature were correct to 1°.

When the current flows through the bath in the dark, a uniform glow of the whole surface of the electrode can be observed by the unaided eye which in a way reminds one of the glow of luminescent material. In a 5% solution of $NaHCO_3$ the onset of the glow occurs at a voltage between 20 and 25v, and with increasing voltage, its intensity correspondingly increases.

By trying a number of different metals and alloys it was noticed that the glow occurs only on aluminum and its alloys. It was characteristic of these, that the color of the radiation of each aluminum alloy remains unchanged independent of the composition of the electrolyte, provided that, in the given electrolyte, the glowing does occur. Thus, for example, pure Al has a pale blue, nearly white radiation; the alloy AMZ has a rather intense orange colored radiation. It is difficult to distinguish visually the characteristics of the glow of the alloy D-1 from the glow of the alloy D-16, since both of them have nearly the same greenish blue radiation, but in contrast to other alloys, D-1 as well as D-16 exhibits an increase in intensity at the edge of the plates (a colored border).

The physical meaning of this phenomenon is not completely clear as yet. In every case it was evident that the glowing occurs only with the production of an oxide film and furthermore only with films of a specific structure, for oxide films on aluminum and its alloys, as is known, have a structure different from the films covering other metals like copper, lead, zinc, etc.

This hypothesis is confirmed by the fact that on first switching on the current the glowing does not begin instantaneously, but only after a certain time interval (0.25 to 0.5 sec); then the intensity of the glowing rises to a definite maximum which requires another time interval (2-4 sec). From this observation the glowing seems to accompany a process of formation of an oxide coating of a certain structure. At the conclusion of the formation of the oxide layer the brightness of the glowing remains constant and with subsequent switching of the current the growth described above is not observed. With the removal of the oxide film by boiling the electrode in alkali, the time for growth of the intensity of the glowing increases (4-5 sec), this being the time required for the appearance and growth of the oxide layer. When direct current is passed through a bath having two electrodes made from one and the same alloy it is observed that the glowing occurs only at the anode, i.e., only with motion of the current in the direction: metal, film, solution, and not in the reverse direction. This confirms again the connection between the glowing and the production of an oxide coating, which has control over this same valve action.

By trying a number of electrolytes, it was determined that the brightest glowing occurs in solutions of $NaHCO_3$, Na_2HPO_4, NaH_2PO_4, Na_3PO_4, NaOH, KOH. Somewhat weaker glowing occurs in solutions of Na_2CO_3, $(NH_4)_2CO_3$. Still weaker glowing occurs in $(NH_4)_2SO_4$, $MgSO_4$. The glowing does not occur in acids. The glowing is also absent in solutions of NaCl, KCl, NaBr and KBr. Furthermore, the addition of one of these salts to a solution in which glowing occurs brings about an attenuation and cessation of the glowing, a sharp increase of the voltage in the circuit and a growth of the temperature of the solution toward the boiling point. At the same time, one observes the onset of instantaneous spark discharges and afterwards unstable electric arcs between the electrodes and the solutions[5].

The concentration of the solutions required for convenient observation varies in its dependence on the degree of dissociation of a given substance. Thus, for $NaHCO_3$, NaH_2PO_4, 1-2% was sufficient, while for NaOH, KOH a smaller concentration was needed. As the concentration was increased, the intensity of the glowing increased correspondingly, up to a definite limit. With an applied voltage of 220v, upon increasing the concentration of the solution (e.g. $NaHCO_3$) with the addition of undissolved soda, one can observe a very beautiful phenomenon of instantaneously flashing and extinguishing tiny spark discharges, superficially resembling scintillation. This phenomenon starts up with the introduction of some more soda, but with the passage of time it grows weaker and stops until more soda is added. During the course of these experiments the temperature of the solution experienced an insignificant rise and only with high concentrations and greater current densities did the solution go as far as the boiling point. For moderate concentrations of the solution (e.g., 1-2% $NaHCO_3$), heating of the electrolyte was almost unobservable (cold glowing) and the temperature of the bath remained constant with the passage of time.

Further studies of this phenomenon will establish its physical meaning and will determine its practical applications; in particular, the ability of each alloy of aluminum to glow with a very specific color may make it possible to bring about the use of the phenomenon for the purpose of spectral-electrolytic analysis.

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The Effect of Absorption of Luminescence on Its Intensity in the Powdered Luminophors

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IN reference 1 the dependence was established of the intensity of luminescence of the powdered