PHASE COMPOSITION AND THERMAL STABILITY OF PRODUCTS FROM ATMOSPHERIC CORROSION OF LEAD

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UDC 620.193.2:669.47

Specimens of lead of grade SO according to GOST 3778-65, obtained by semicontinuous casting, were subjected to natural corrosion tests. The climatic conditions of the tests were evaluated according to the duration of the wetting of the metal surface [1], which amounted to 1700, 1250, and 2000 h/year for regions A, B, and C, respectively. The atmosphere was contaminated with sulfur dioxide, the concentration of which was measured monthly by a linear-coloristic method [2]. The average sulfur dioxide content for regions A and B amounted to 0.25 and 0.13 mg/m^2, respectively; in region C there were traces of sulfur dioxide (with relative fluctuations of 10-20%).

The phase composition and thermal stability of the powdery corrosion products was determined 2 years after the beginning of the tests. The composition and proportions of the components were determined by x-ray diffraction and infrared spectroscopy [3] and refined thermographically on the Kurnakov pyrometer designed at the Institute of General and Inorganic Chemistry, Academy of Sciences of the USSR. The content of products subjected to thermal decomposition was determined from the loss in weight at the corresponding temperature effects, and the PbO content was determined by difference. The results from spectral and x-ray analysis and the temperature effects on the thermograms agree well with each other and with the published data for basic lead carbonates and sulfates [4-7].

As seen from Table 1, the phase composition of the products depends on the conditions under which the tests were carried out. Thus, in the atmosphere of regions A and B basic sulfates are formed, and the amount increases with increase in the sulfur dioxide concentration. In these regions when there is moisture on the surface for approximately equal times the quantitative proportions of the isomorphous $2PbCO_3 \cdot Pb(OH)_2$ and $Pb_3(CO_3)_2 \cdot (OH)_2$ are determined by the protonation rate of the hydrooxo complexes [8], which depends on the pH of the electrolyte and, consequently, on the sulfur dioxide content of the atmosphere. In region C formation of $2PbCO_3 \cdot Pb(OH)_2$ predominates on account of the absorption of carbon dioxide by the $Pb(OH)_2$.

TABLE 1. Phase Composition of Products from Corrosion of Lead in Various Test Regions

Region	Phase composition of corrosion products	Content of components in mixture, %
A	$2PbCO_3 \cdot Pb(OH)_2$	~45
	$Pb_3(CO_3)_2 \cdot (OH)_2$	~25
	$4PbO \cdot PbSO_4$	~25
	PbO	~5
B	$2PbCO_3 \cdot Pb(OH)_2$	~55
	$Pb_3(CO_3)_2 \cdot (OH)_2$	~40
	$4PbO \cdot PbSO_4$	~3
	PbO	~1
C	$2PbCO_3 \cdot Pb(OH)_2$	~75
	PbO	~22

Central Scientific-Research Laboratory. Translated from Zashchita Metallov, Vol. 8, No. 6, pp. 711-712, November-December, 1972. Original article submitted November 9, 1971.

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