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STUDY OF THE CORROSION RESISTANCE OF VARIOUS METALS TO THE ACTION OF DICHLOROETHANE

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Foreign Technology Division Wright-Patterson Air Force Base, Ohio

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STUDY OF THE CORROSION RESISTANCE OF VARIOUS METALS TO THE ACTION OF DICHLOROETHANE

By: A. Popov, M. I. Goryayev, and M. G. Pugachev

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* ye initially, after vowels, and after b, b; e elsewhere. When written as ë in Russian, transliterate as yë or ë. The use of diacritical marks is preferred, but such marks may be omitted when expediency dictates.

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STUDY OF THE CORROSION RESISTANCE OF VARIOUS METALS TO THE ACTION OF DICHLOROETHANE

A. Popov, M. I. Goryayev, and M. G. Pugachev

The question of the resistance of various metals to the action of dichloroethane is of interest from the point of view of the selection of material for equipment in the hydrolysis of vegetal resources by concentrated sulfuric acid in this solvent.

As is known, hydrolysis proceeds in two stages. First, the polysaccharides of the vegetal resources are converted to lowmolecular oligosaccharides in an organic solvent at a comparatively low temperature (50-80°) with the use of concentrated sulfuric acil. Then the obtained hydrolysate mass is diluted with water to a 5-7.5% concentration of sulfuric acid in it and the

ligosaccharides are converted to monosaccharides by heating with the simultaneous distillation of the solvent from the hydrolysate.

Under the indicated temperature conditions the molecules of dichloroethane and water enter into a hydrolysis reaction with the formation of a volatile hydrochloric acid which has a strong corroding action on the material of the equipment



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In literature there are quantitative characteristics of the corrosion of steel in the presence of moist dichloroethane and a mixture of vapors of dichloroethane and water [1, 2]. Under these conditions the corrosion of steel is insignificant with a duration of test of several hours it comprises 0.25-0.50 g/m² (1 mm of surface thickness is destroyed in 3-4 years).

Ellis [3] points out that dichloroethane is the most stable of the generally accepted chlorinated hydrocarbons and, in the presence of water at boiling temperature, does not cause corrosion of metal equipment. However, in the literature presented there are no direct indications of the stability of dichloroethane dissolved in water at boiling temperature which is favorable for hydrolysis. In this connection, we have conducted the corresponding tests, the results of which are presented in Table 1.

We determined the degree of hydrolysis from the acidity of the solution by means of its titration with 0.1 normal solution of KOH in the presence of phenolphthalein. In this regard, used in the tests was circulating dichloroethane with which the repeated hydrolysis of cotton pods was conducted with concentrated sulfuric acid. In the process of repeated distillation, the dichloroethane was cleansed of foreign substances and seemed to be stabilized.

From Table 1 it can be seen that the acidity of the solution increases only after three hours of boiling.

Duration of boiling.	Degree of hydrolysis.
hours	¥
1 •	0,00
23	0.05
3	0,44 0,86
5,5	1,80
9,5 12,0	2,05
12.0 1 6.0	2.20
15,0	2,50
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Table 1. Increase in the acidity of solution of dichloroethane depending on the duration of boiling.

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The technological scheme provides for the stay of the dichloroethane in the hybrolysate at boiling temperature for no more than 0.5 hours. Moreover, it is necessary to consider that the quantity of dichloroethane in the solution will be reduced with its removal from 13 kg to 2 g in one cubic meter of hydrolysate during the time of 0.5 hours. Consequently, the amount of hydrochloric acid being formed will be reduced in the same sequence. Practically no decomposition of the dichloroethane occurs during three hours of boiling. Hence it follows that there will be almost no products of the hydrolysis of dichloroethane - hydrochloric acid and glycol - in the hydrolysate. NAMES IN

The tests of the resistance of metals to dichloroethane in a solution of a heteroaneotrope of the dichloroethane-hydrolysate system which were conducted at boiling temperature for 24 hours showed the following results (Table 2).

	Weight loss from 1 cubic meter in a day, grams						
Test conditions	lead	steel 5	copper	aluminum	stainless sterl iKh18N9T	cast iron SCh-15	
In liquid In an atmosphere of dichloroethane vapors	0, 6739 0, 2 115	1,1718 2,0104	0,6513 0,1861	0, 096 9 0,0781	0,8865 1,4907	2,4694 8,2360	

Table 2. Resistance of metals in dichloroethane.

As can be seen from the table, the most stable metals to the action of dichloroethane are copper and aluminum while cast iron SCh-15 is less resistant. Loss of weight of the metals was insignificant.

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Tests on the study of corrosio.) resistance of metals to the action of dichloroethane showed that the loss in the weight of metals in an atmosphere of this solvent is insignificant and -

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the dichloroethane molecule is comparatively stable; the acidity of a solution of dichloroethane in boiling increases noticeably only by the third hour. Therefore, there is no need to fear heavy corrosion of equipment in using dichloroethane as a solvent in the process of the hydrolysis of vegetal resources by concentrated sulfuric acid.

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