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Study of the Cleaning Process of the Waste Waters with Zinc Ions Content

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Abstract The studies have followed to establish the conditions in the cleaning process of the waters with Zn content and the capitalization of Zn in form of ZnC_2O_4. Keywords: zinc extraction degree, zinc oxalate,

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1. Introduction

Starting with the present industrial platforms, especially the electrotechnical, mechanical engineering and shipbuilding industries, brances of the extraction mining industry, lacqver, dyes, cellulose and paper, plastic masses industries, until the organic synthesis of whose procesing demands zinc compounds, zinc and its combinations, especially salts, oxides, carbonates, represent an important raw material for the above mentioned technologies, material for which there is the matter of the advanced recovering, the returning in the technological process, the temporary stock or other methods for the industrial process profitableness.[1,2]

Simultaneosly and convergent with these problems in the material saving, it is also necessary to solve the environmental pollution problem, the correct placement between the ecological problems, the solving of the impact problem on the life in general.[3]

The zinc chemical species-included in the waste materials of these products, basically acid waste waters, alkaline waters, cleaning agents, passivation, can be qualitatively appreciated in the from of: $ZnSO_4$, ZnO, $ZnCl_2$, $Zn(NO_3)_2$, zinc phosphates, sulphuric acid, phosphoric, ammonium chloride, sodium hydroxide.[4]

The studies made have pursue the establishing of the optimum conditions of the cleaning process of some zinc acid waste waters (from the acid zinc coating) and the recovery of the zinc in the from of zinc oxalate.

2.Experimental data

Taking into consideration the fact that waste waters from the acid zinc coating have a medium content of about 6,3g Zn/dm^3, studies have been made on a zinc sulphate solution 0,1 M.

As reactant it was used an oxalic acid solution 0,5 M. The waters'zinc content has been determined complexonometric (titration with C III 0,05 M in the presence of black eryochromium, at pH=10) and by atomic absorbing. [5,6]

For the atomic absorbing it was used an atomic absorbing spectrophotometer type AAS-30 Karl Zeis Jena.

The zinc sulphate solution 0,1M under continuos stiring, at an well determined pH, with an well defined report zinc/oxalic acid, at temperature and concentrations determined.

Studies of the zinc recovery process in the form of zinc oxalate [7].

The researches have follwed the influence of the process different parameters (pH of the reaction mass, oxalic acid dose, zinc concentration, temperature) on the zinc extraction degree.

a.pH of the reaction mass

The experimental data concerning the influence of the reaction mass pH on the zinc extraction degree are given in the table 1 and figure1.

TABLE 1. The extraction degree dependence on the Ph of the reaction mass at an excess of 10% oxalic acid, at t=20˚C, reaction 10 minutes.

No.crt.	pH	α, %	No.crt	pH	α, %
1.	1	95,29	6.	3,5	97,25
2.	1,5	95,68	7.	4	97,67
3.	2	96,08	8.	4,5	97,67
4.	2,5	96,48	9.	5	97,67
5.	3	96,88			

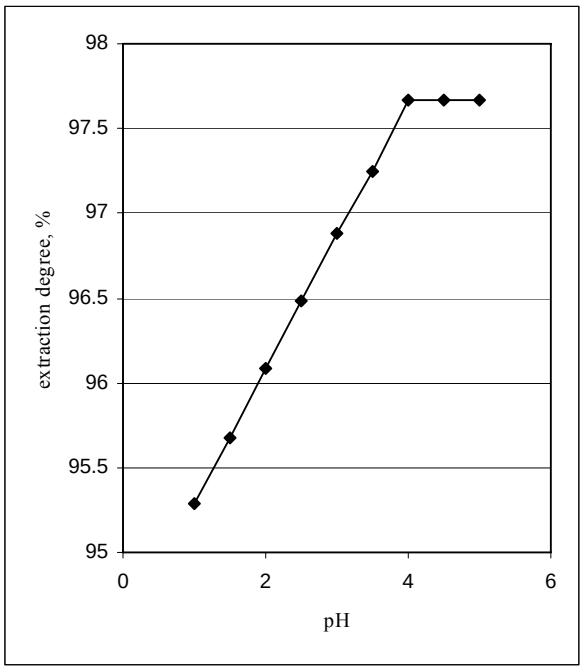

Figure 1. Extraction degree dependence on the reaction mass pH.

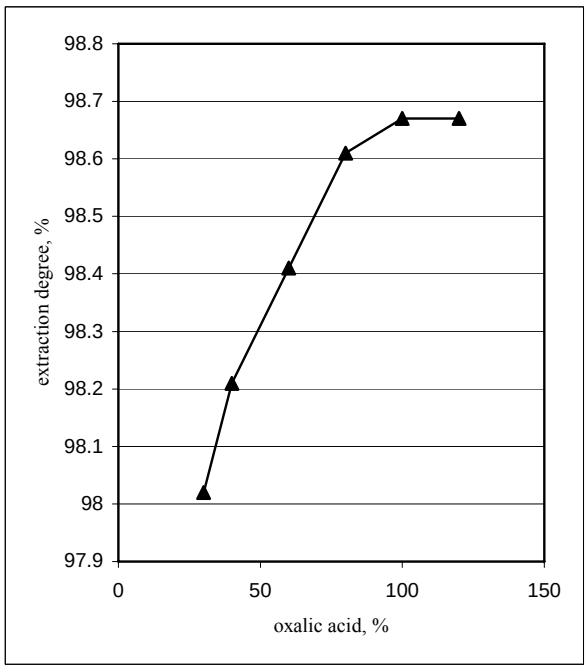

Figure 2. Extraction degree dependence on the oxalic acid excess.

From these data result that the extraction degree increases at the same time with the increasing of pH until pH=4 and that it stays unchanged.

Therefore, it can be considered that the process optimum pH is pH≥ 4.

b.Oxalic acid dose

The experimental data regarding the dose-oxalic acid excess are given in table 2 and figure 2.

Table 2. The extraction degree dependence on the oxalic acid excess, at temperature of 20˚C, reaction time 10 minutes, pH=4,5.

No.crt	Excess,%	A, %	No.crt	Excess,%	α, %
1.	10	97,67	5	60	98,41
2.	20	97,83	6	80	98,61
3.	30	98,02	7	100	98,67
4.	40	98,21	8	120	98,67

The experimental data show that the extraction degree increases only in a small measure with the increasing of the oxalic acid excess and tends to a constant at an excess of over 100%.

The optimum excess can be considered ≥60%.

c.Zinc concentration

The experimental data regarding the solution zinc concentration influence on the separation degree are given in table 3 and figure 3.

Table 3. Extraction degree dependence on the zinc concentration in solution at 20˚C, reaction time 10 minutes and pH=5.

No.crt.	C[M]	α, %	No.crt	C[M]	α, %
1.	0,01	91,19	4.	0,033	96,97
2.	0,0166	93,74	5.	0,05	97,55
3.	0,025	94,66	6.	0,1	98,67

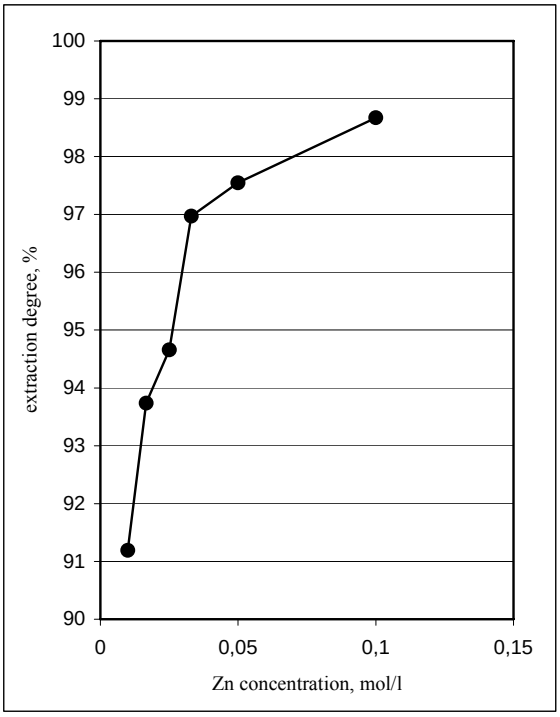

Figure 3. Extraction degree dependence on the solution concentration .

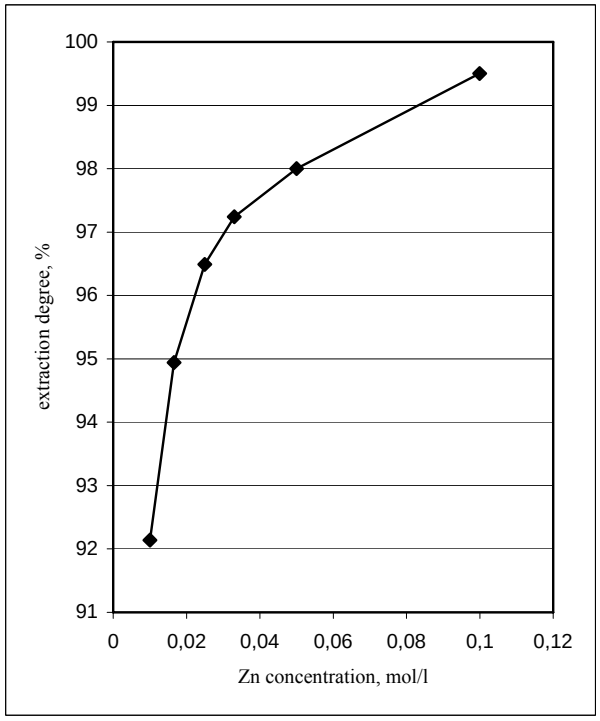

Figure 4. Extraction degree dependence on the zinc concentrations in solution at different temperatures.

d.Temperature

The experimental data regarding the influence of the temperature on the zinc extraction degree at different concentrations are given in tables 3 and 4, respectively figure 4.

Table 4. The extraction degree dependence on the zinc concentrationin solution at temperature of 70˚C, pH=4,5 and reaction time 10 minutes.

No. crt.	C[M]	α, %	No. crt.	C[M]	α, %
1.	0,01	92,14	4.	0,033	97,24
2.	0,0166	94,94	5.	0,05	98
3.	0,025	96,49	6.	0,1	99,50

From these result that the curves of extractions degree dependence on the zinc from solution concentration have the same rate. For the same concentration, the extraction degree is bigger as the temperature is higher. The increasing is relatively small of about 1%, which does not justify, economical point of view, the process leading to higher temperatures.

Consequently, the optimum temperature of the process can be considered 20˚C.

3. Conclusions

The experimental researches have allowed to be established the following process optimum conditions of zinc separation: pH=5, oxalic acid excess ≥ 60%, zinc concentration in solution ≥ 0,03M, temperature 20˚C,when it is accomplished an extraction degree of 99,5%.

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