THE RECOVER OF ZINC AND COPPER IONS FROM WASTES RESULTED IN INDUSTRY

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ABSTRACT

In many branches of industry result wastes with a high amount of hard metals. The most of these wastes are stored in land – filling, which present a potential risk of environmental pollution.
From brass foundries industry result sludge with a content of 6-8% zinc and 3-5% copper and small amount of lead.
In the present work we try to recover and to separate the zinc and copper ions from this sludge by extractions in H_2SO_4 and HCl medium at the different concentrations (5%, 10%).
A maxim degree of separation of metals ions was achieved at an agitation time of 60 minutes, an acid concentration of 10% and by using for extraction HCl.

KEYWORDS:
wastes, hards metals, recover

1. GENERALITIES

In the recent years, to a drastic reduction the amount of wastes and to avoid the pollution, the attention was point to recycling of wastes, to recover and to turn to account these.

From brass foundries industry result sludge with a content of 6…8% zinc and 3…5% copper and small amount of lead.

In the present work we try to recover and to separate the metals ions from this sludge by extractions in H_2SO_4 and HCl medium at the different concentrations. The researches permitted the fixing of optimal conditions to achieve a maxim degree of separation of metals ions.

2. WORKING METHOD

The sludge was dried and baked, and was determinate a humidity of 54% and a baking loss of 52%. The dry and baked sample was analyzed by spectrophotometer method for the determination of the metals ions concentrations. The results are presented in table 1.

TABLE 1. THE CONCENTRATION OF METALS IONS IN THE SLUDGE

Metal ion	Pb	Cu	Zn
Concentration, %	2	5	8

Samples of 5 grams were treated with 20 ml of H_2SO_4 and HCl with a concentration of 5% and 10%, under continues agitation, time well determinate, at a constant temperature. After agitation the samples were filtrated and in the solution resulted after filtration, was determinate the content of metals ions by spectrophotometer method, using an atomic absorption spectrophotometer VARIAN SpectrAA 110.

a. Extraction with H_2SO_4 solutions

The experimental data about the dependence by time of the metals ions degree of separation with 5% H_2SO_4 solution, respective 10% are presented in table 2 and figures 1-3.

The experimental data shows that we achieve a maximum degree of extraction of the metals ions by using for extraction 10% H_2SO_4 solution at an agitation time of 60 minutes.

TABLE 2. THE DEPENDENCE BY TIME OF THE METALS IONS DEGREE OF SEPARATIONS

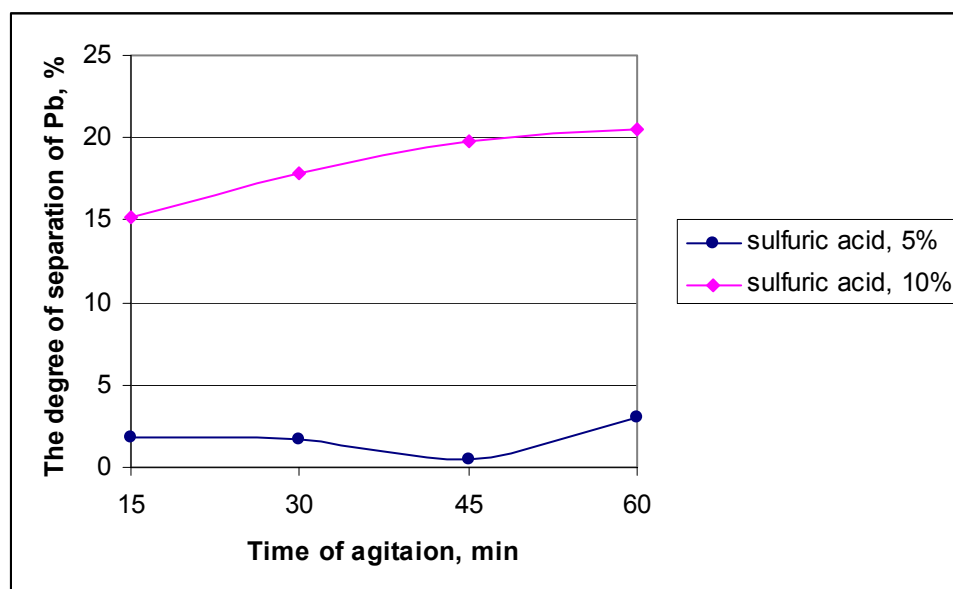| Degree of separation / Time, min	H_2SO_4, 5 %			H_2SO_4, 10%		
	Pb, %	Cu, %	Zn, %	Pb, %	Cu,%	Zn,%
15	1,87	6,28	32,18	15,17	7,44	45,9
30	1,73	5,63	34,83	17,86	12,35	73,36
45	0,44	6,38	34,55	19,79	11,69	63,33
60	2,99	4,23	36,08	20,53	17,14	73,70

Figure 1. The dependence by time of Pb ions degree of separation

The degree of extraction of the Pb ions depends by time of agitation. The degree of separation is higher with the increase of the agitation time in both cases.

The degree of separation of the Cu ions in the case of using for the extraction 5% H_2SO_4 solution present a constant value with the increase of the agitation time. In the case of using for extraction a 10% H_2SO_4 solution the degree of separation of Cu present a linear increase with the increase of the agitation time and achieve a maxim value at the agitation time of 60 minutes.

The degree of separation of Zn ions is higher when we use for extraction 10% H_2SO_4 solution and achieve a maxim value at an agitation time of 30 and 60 minutes (12…26%).
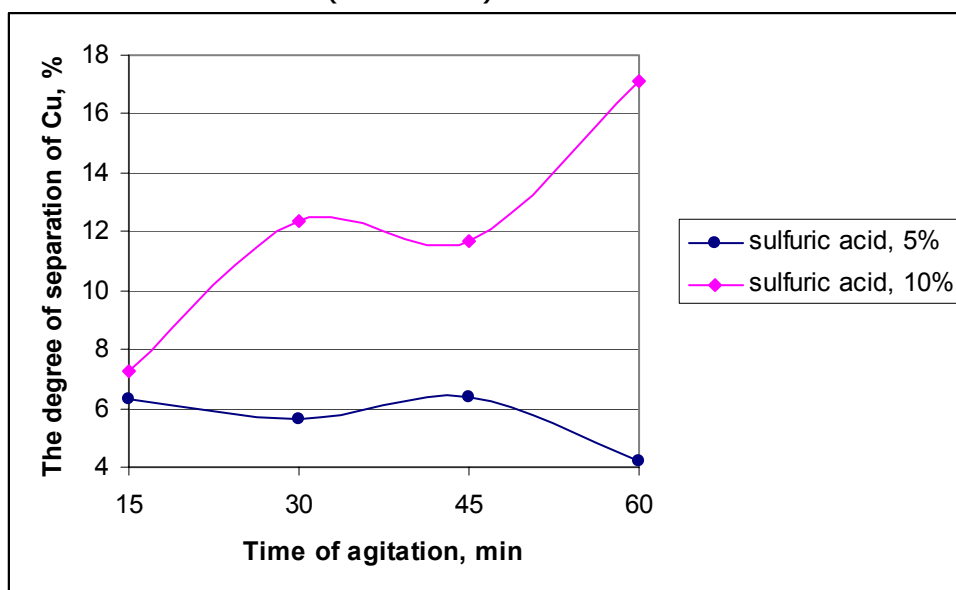

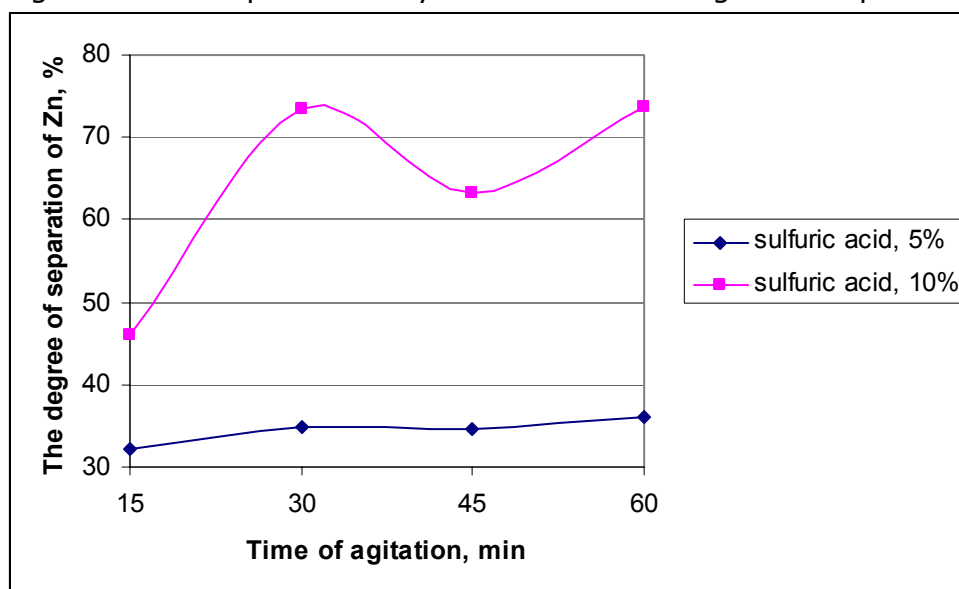Figure 2. The dependence by time of Cu ions degree of separation

Figure 3. The dependence by time of Zn ions degree of separation

b. Extraction with HCl solutions

The experimental data about the dependence of the metals ions degree of separations are presented in table 3 and figure 4…6.

The degree of separations of Pb ions in the case of using for extraction 5% HCl solution is very small and in the case of using for extraction 10% HCl solution we obtain a degree of separation more than 90%.

TABLE 3. THE DEPENDENCE BY TIME OF THE METALS IONS DEGREE OF SEPARATIONS

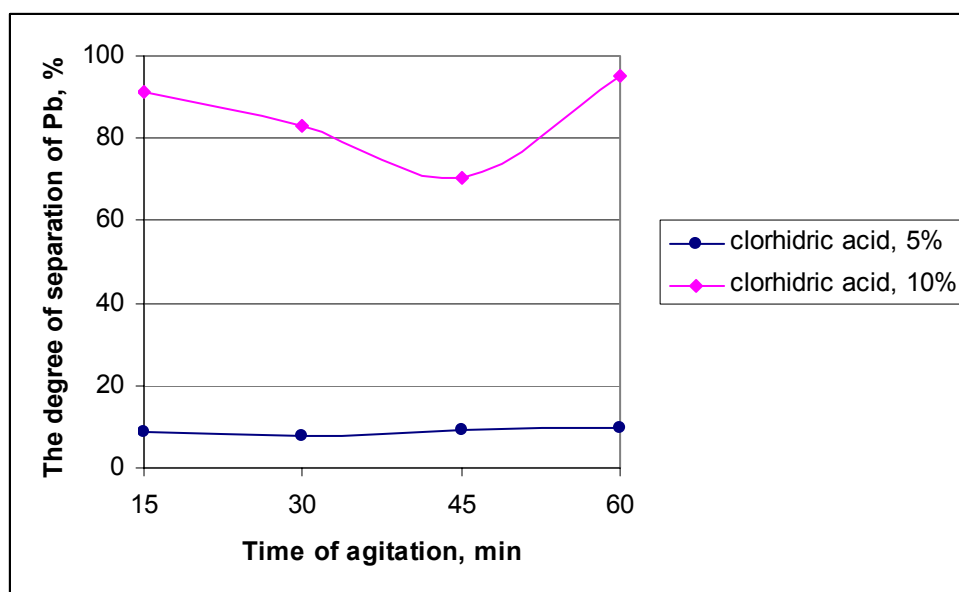| Degree of separation / Time, min	HCl, 5 %			HCl, 10%		
	Pb, %	Cu, %	Zn, %	Pb, %	Cu,%	Zn,%
15	8,84	26,14	65,21	91,05	51,21	74,12
30	7,82	43,57	73,12	83,17	63,17	82,21
45	9,01	43,42	86,56	70,15	44,12	94,17
60	9,69	44,41	80,28	95,25	55,25	92,69

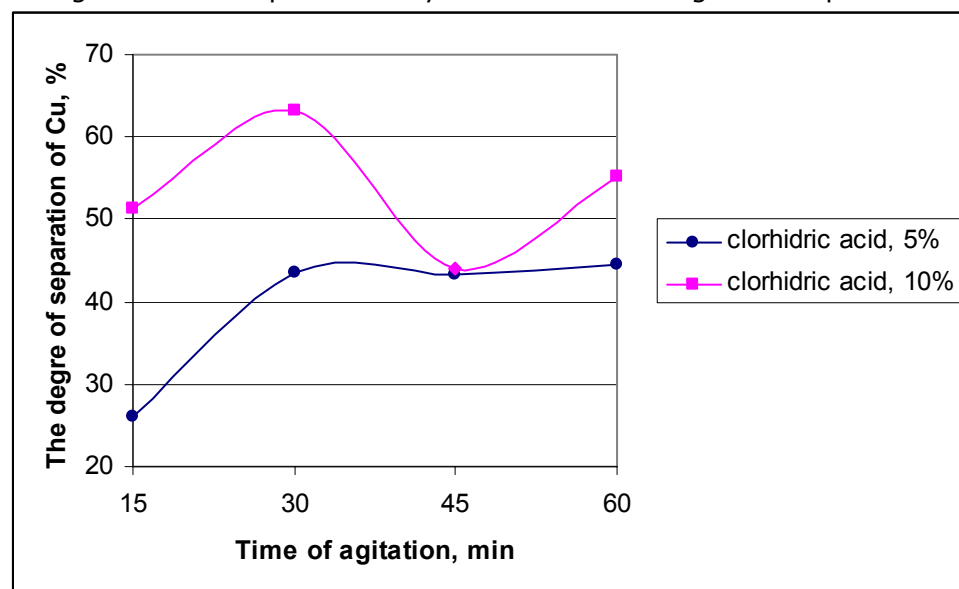Figure 4. The dependence by time of Pb ions degree of separation

Figure 5. The dependence by time of Cu ions degree of separation

The degree of separation of Cu ions depends of the agitation time. This increase with the increase of the process time and achieve a maxim value at the agitation time of 30 and 60 minutes.
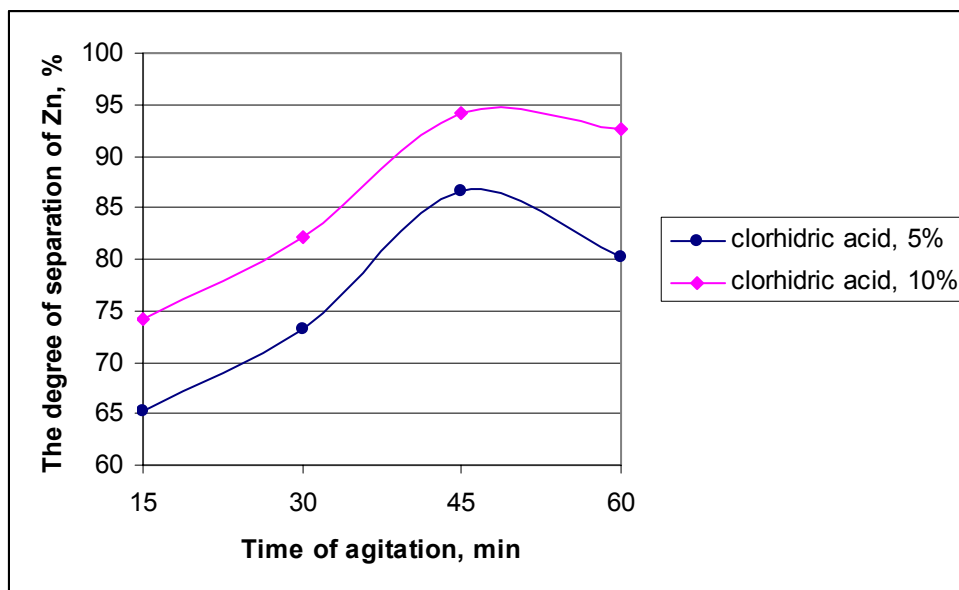
Figure 6. The dependence by time of Zn ions degree of separation

The dependence by time of Zn ions degree separation present a linear increase and achieve a maxim degree of extraction ≈ 95% in the case of using for extraction 5% HCl solution and ≈ 80% in the case of using for extraction 10% HCl solution.

The experimental data show that we obtain a higher degree of separation of the metals ions when we use for extraction HCl solutions that when we use for extraction H_2SO_4 solutions. This conclusion results also from the next figures.

In figure 7 is presented the degree of separation of the metal ions from the sludge when is used for extraction 5% acid solutions at the agitation time of 60 minutes.

In the figure 8 is presented the degree of separation of the metals ions from the sludge when is used for extraction 10% acid solutions at the agitation time of 60 minutes.
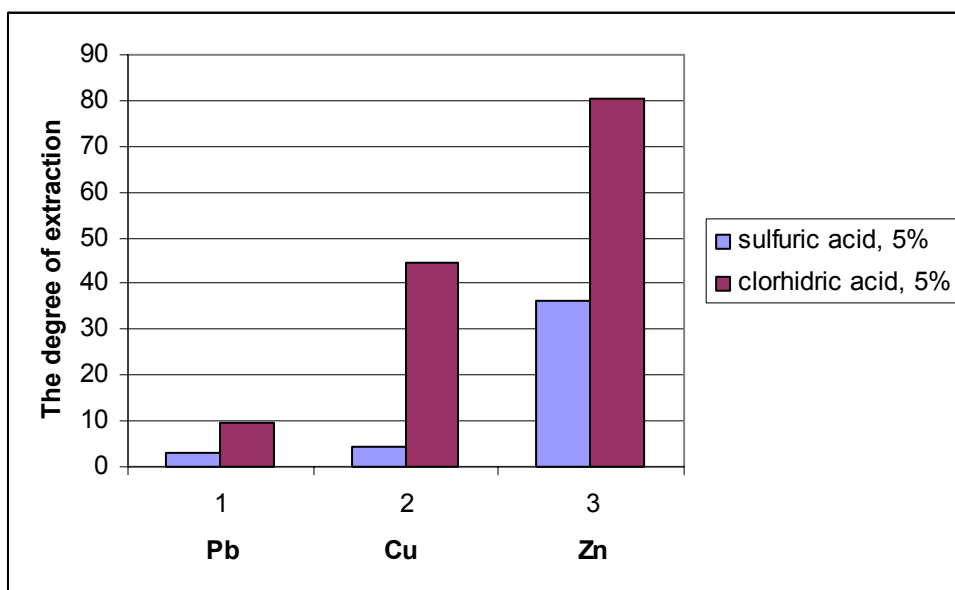

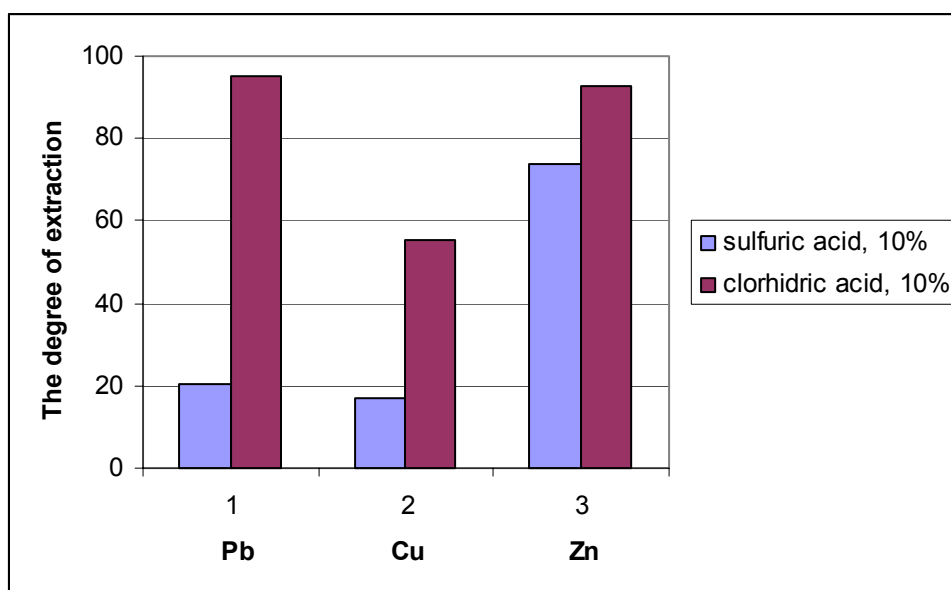Figure 7. The degree of extraction of metals ions in 5% acids solutions

Figure 8. The degree of extraction of metals ions in 10% acids solutions

CONCLUSIONS

The optimal conditions of the extraction process of the metals ions, from sludge resulted from brass foundries industry, with H_2SO_4 solutions and HCl solutions, what determinate maxim grads of separation of metals ions are:

❑ process time of 60 minutes;
❑ the concentration of acid solution used 10%.

The grads of separation of metals ions are higher in the case of use for extraction of HCl solutions that in the case for use for extraction of H_2SO_4 solutions.

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