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PROCESS AND TECHNOLOGICAL FLUX FOR NICKEL RECOVER

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ABSTRACT:
The study is a cleaning method of waste waters with Ni content in the purpose to establish the optimum conditions for the cleaning process, by retrieving in the same time the metal (Ni) in the form of Ni CO_4 $2H_2O$.
The parameters witch was studied are: pH, excess of reactant reagent, concentration, temperature.

1. GENERAL REMARKS

The mechanical engineering industry, the electrical engineering industry and the related branches use on a large scale the technology of electrochemical covering -the nickel plate- from whose technical process result washing waters with low nickel content, as well as consumed electrolytes, with a higher metal concentration, waste waters that need to be cleaned.

Their concentration, mainly those from chemical and electrochemical nickel plate, on different metallic or non-metallic supports go up to the values of 5-7 g Ni and 100-1500 mg Fe/l. [1]

Taking into consideration the facts above mentioned, the experimental researches have observed the best conditioned of the cleaning process of the waste waters with nickel content, by recovering in the form of nickel oxalate. [2]

The advance cleaning of these waters solves so much for the economical as for the ecological aspects of the environmental protection. [3, 4]

2. METHOD OF WORK

In the process are used concentration solutions 0, 1 M- of nickel chloride and oxalic acid solution 0,5M.

The chemical analysis of the nickel ion concentration and of the recovered product nickel oxalate- has been accomplished by proper analysis techniques: volumetric, flame atomic absorption spectrophotometer, (FAAS), thermo gravimetric and thermo differential analysis, (TTA) of Nick O_2H.
The nickel content has been analyzed complexonimetric [5, 6] by complexion III 0,05M at pH=10, in presence of ammonium purported and by atomic absorption on a spectrophotometer type AAS 30-Karl Zeus Jena.

3. STUDIES OF THE NICKEL RECOVERING PROCESS IN THE FORM OF NICKEL OXALATE [2]

The researches have observed the establishment of the process best conditions, respectively the influence of different factors (pH, oxalic acid dose, nickel concentration, temperature) on the nickel extraction degree.

a) PH of the reaction mass

The experimental data regarding the extraction degree dependence on the pH are shown in table no.1.

The dependence of the nickel extraction degree on the pH of the reaction mass at 20 ^{o}C, at an oxalic acid excess of 10%, reaction time 10 minutes, concentration 0,1M.

Nacre	pH	α %	No. Cre.	pH	α%
1	1	62	6	4.5	70.19
2	2	66	7	5	70.28
3	3	66	8	5.5	70.49
4	3.5	67.4	9	6	70.49
5	4	69.22			

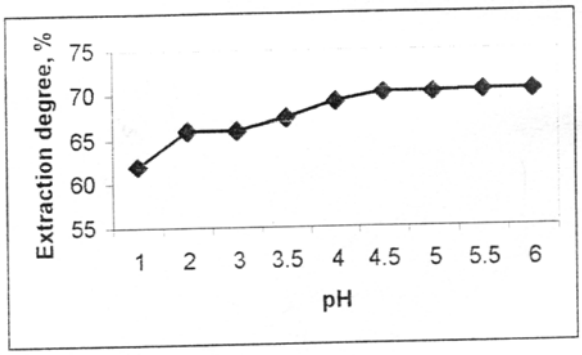

Figure 1. Extraction degree dependence on the reaction mass pH.

From these data result that extraction degree increases with the pH increasing, tending to constant value at pH ≥ 4.5

Therefore, the best pH for the process is pH ≥4.5.

b) Oxalic acid dose

The data regarding the dependence of the extraction degree on the oxalic acid excess, at pH≥ 4.5, temperature 20^{0}C and nickel concentration 0,1M are shown in table no.2 and figure no.2.

Table 2 . The dependence of extraction degree on the oxalic acid excess, at pH≥4.5 temperature 20^{0}C and nickel concentration 0,1M

No.crt.	Excess,%	α %	No.crt.	Excess,%	α %
1	10	70.49	5	60	93.53
2	20	74.13	6	80	94.75
3	30	79.79	7	100	96.88
4	40	85.85	8	120	96.88

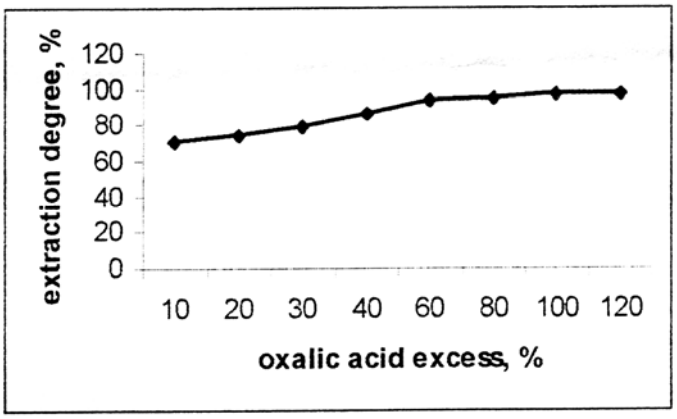

Figure 2.Nickel extraction degree dependence on the oxalic acid excess.

From the se data result that at an excess of 100% of the oxalic acid it is accomplished the maximum degree of extraction for the studied conditions.

c) Temperature

The experimental data regarding the extraction degree dependence on the temperature are shown in table 3 and figure 3.

Table 3.The dependence of the nickel extraction degree at different temperatures, at 100% oxalic acid excess, pH=4.5 and nickel concentration 0,1M.

No.crt.	T	α %	No.crt.	T	α %
1	20	96.88	3	60	97
2	40	96.88	4	80	98.56

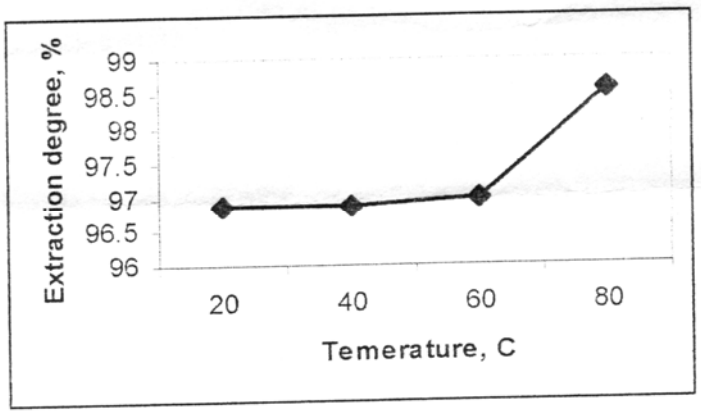

Figure 3.Extraction degree dependence on the temperature

From the data presented it that the nickel extraction process is favored by the temperature increasing, being at its best at the temperature of 80^0C.

d) Nickel concentration

The experimental data concerning the dependence of the extraction degree on the nickel concentration in solution are shown in table 4 and 5, figure 4 and 5.

Table 4.Nickel extraction degree dependence relying on the nickel concentration in solution at 20 ^{0}C, reaction time 10 minutes, oxalic acid excess 100% and pH=4.5.

No.crt.	C[M]	α %	No.crt.	C[M]	α %
1	0.001	28.4	5	0.025	90.67
2	0.01	54.17	6	0.033	92
3	0.016	82	7	0.05	94
4	0.02	86.67	8	0.1	96.88

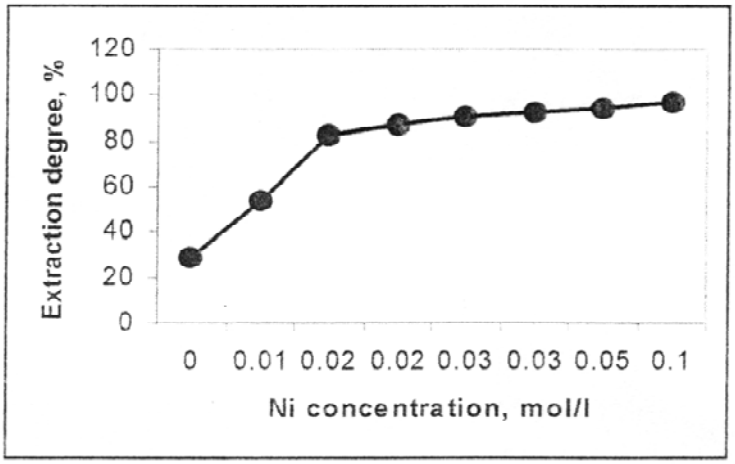

Figure 4.Extraction degree dependence on the nickel concentration in solution

Table 5. Nickel extraction degree dependence on the nickel concentration in solution, at 80 ^{0}C, reaction time 10 minutes, oxalic acid excess 100%,pH=4.5.

No.crt.	C[M]	α %	No.crt.	C[M]	α %
1	0.005	84.80	5	0.033	98.40
2	0.01	94.66	6	0.05	98.55
3	0.02	98	7	0.1	98.55
4	0.025	98.40			

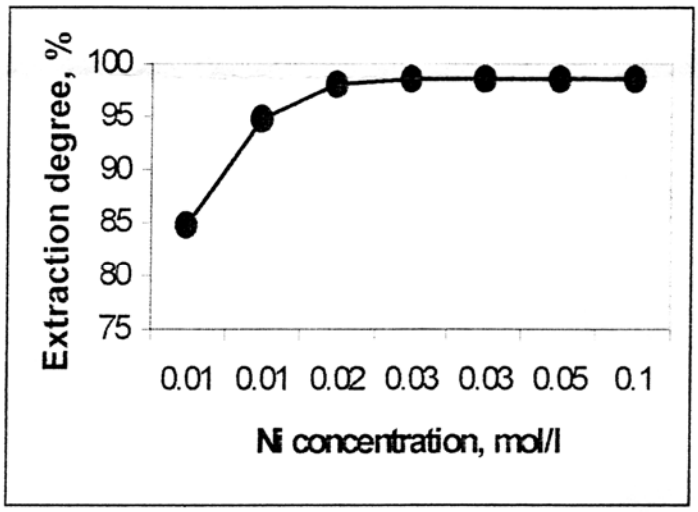

Figure 5. Nickel extraction degree dependence on the nickel concentration in solution

Consequently, the nickel recovering process at temperature of 80 ^{0}C is efficient for the waste waters with nickel content bigger than 0.02M.

From the experimental data result that the separation degree at temperature of 80^{0}C tends to a constant value, at a concentration 0.02 M

Conclusions

In order to accomplish a maximum separation degree of the nickel from residual solutions in the form of nickel oxalate, it is necessary that the following best conditions of the process to be carried out: pH=4.5, oxalic acid excess 100%, nickel concentration in the residual solution ≥0.02M temperature 80^{0}C, accomplishing an extraction degree of 98,55%.

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