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PROCESS AND TECHNOLOGICAL FLUX FOR NICKEL RECOVERY- PART TWO

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Abstract:
The obtained precipitate of nickel oxalate dehydrate, was washed, dried and analysed through chemical methods and therm analisys, using a derivatograph type Paulik,Paulik and Erdely.
In this work, was established the optimal temperature necessary to obtain nickel oxide (NiO), also technological flux.[1]
Crystalline form of $NiC_2O_4 \cdot 2H_2O$ permited a rapidly and economical recovery of nickel from waste waters. Decantation, filtration and washing of a oxalate dehydrate, are more efficiently face to amorphous:$Ni(OH)_2$, $NiCO_3$, Ni_2O_3, or nickel phosphate.

1. CHEMICAL ANALISYS OF NICKEL OXALATE[2,3]

In ordear to obtain the results about chemical composition, the precipitate was dissolved in 18% HCl c.p. solution. Nickel content was determined by gravimetric method with dimethylglyoxime, and also against chelating agent, using Tritiplex III 0.05M (F=1), ammonia solution pH 10 and murexide as indicator. Anion oxalate was volumetric determined using $KMnO_4$),1 N (F=1) and H_2SO_4 4N, 15 ml for each 50 ml solution for oxalate determining. Regents were chemically pure.Dates are presented in table 1

Table 1 Chemical composition of nickel oxalate

Numar proba	Ni, %	$C_2O_4^{-2}$, %	H_2O_{cr}, %
1	31,9885	47,9243	20,0870
2	31,9683	47,8904	20,o863
3	32,0081	47,9056	20,0863
Average	31,9883	47,9067	20,105

Conlusions from thes dates: nickel oxalate is in a dehydrate crystalline form, $NiC_2O_4 \cdot 2H_2O$

2. THERMOGRAVIMETRIC AND THERMODIFFERENTIAL ANALISYS (TTA)[4]

The green and crystalline precipitate of nickel oxalate was analysed by TTA on a derivatograph MOM (Hungary)using next technical parameters:
TG-100mg content
TG-sensibility 100 mg
DTG-1/5
DTA-1/3
T (rate) 5^0C/min, 500^0C

Platinum cylindrical crucible, static air condition for DTA, reference sample alfa Al_2O_3. Nickel oxalate derivatograme is presented in figure 1.

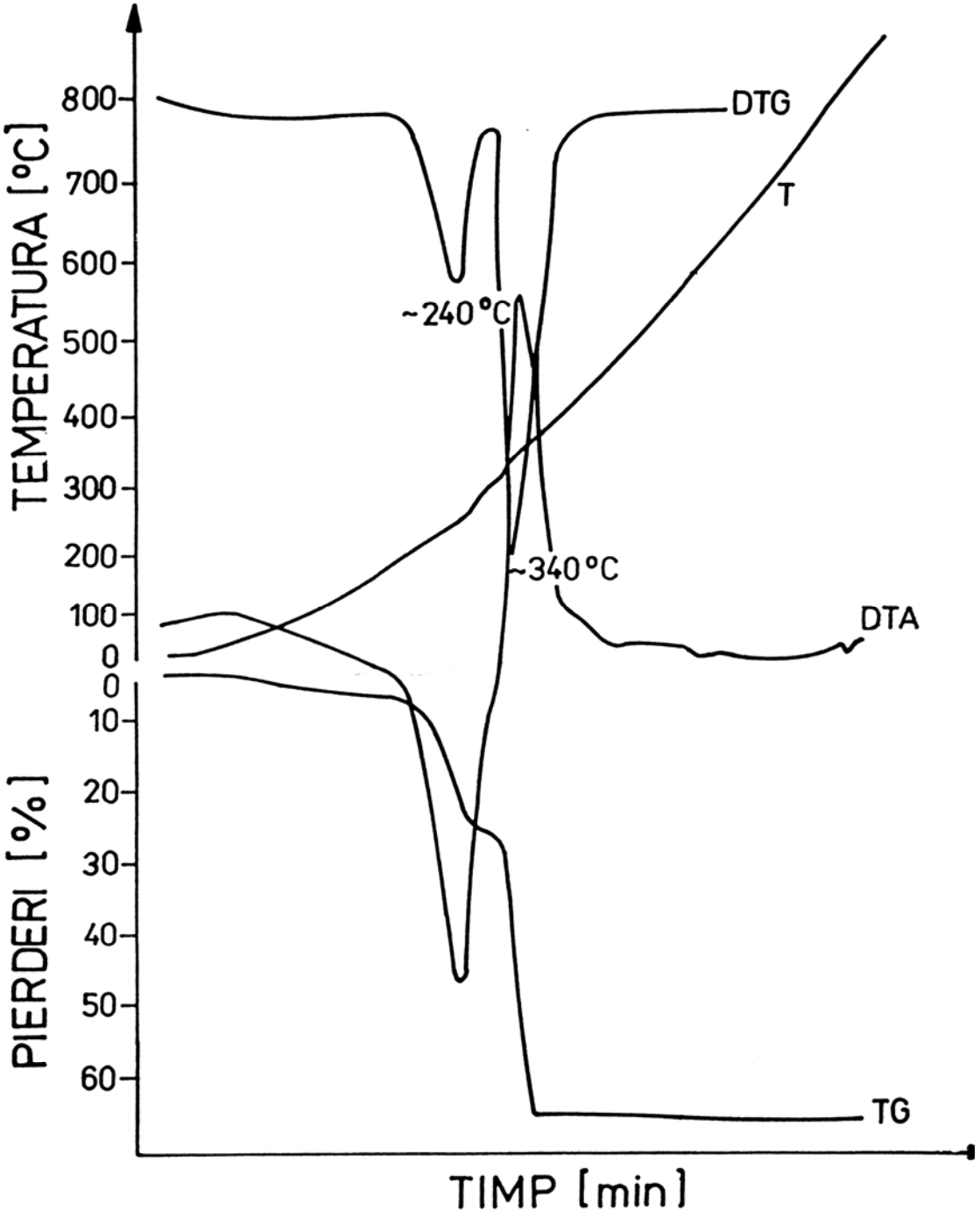

Figure 1. TG, DTG, and DTA curves of nickel oxalate

The product lose crystallization water-theoretically m=19,7%, practically 29%-between 100-240^{0}C. Thermal decomposition of nickel oxalate begins at 320^{o}C and stops at 360^{0}C, when NiO is obtained. Decomposition reactions were:

$NiC_2O_4*2H_2O \rightarrow NiC_2O_4 + 2H_2O$ (1)
$NiC_2O_4 \rightarrow NiO + CO + CO_2$ (2)

Nickel oxalate obtained in cleaning process and recovery as subproduct may be used to obtain nickel oxide at low temperature, for different utilization. Also it can prepared pure Ni, using suitable reagent reduction[6]. Nickel can be utilized in many direction, specially for alloys and steels[5].

3. TECHNICAL FLUX FOR NICKEL IONS RECOVERY

Based on experimental data, a product recovery flux is proposed according to diagrame 2

In this process oxalic acid excess also remnant nickel too, is removed in shape of calcium oxalate and nickel hydroxide by 10% lime cream ($Ca(OH)_2$) precipitation. Clear solution lack of Ni and oxalic acid, can be overflow. Nickel recovery in these method are 98,55% assured.

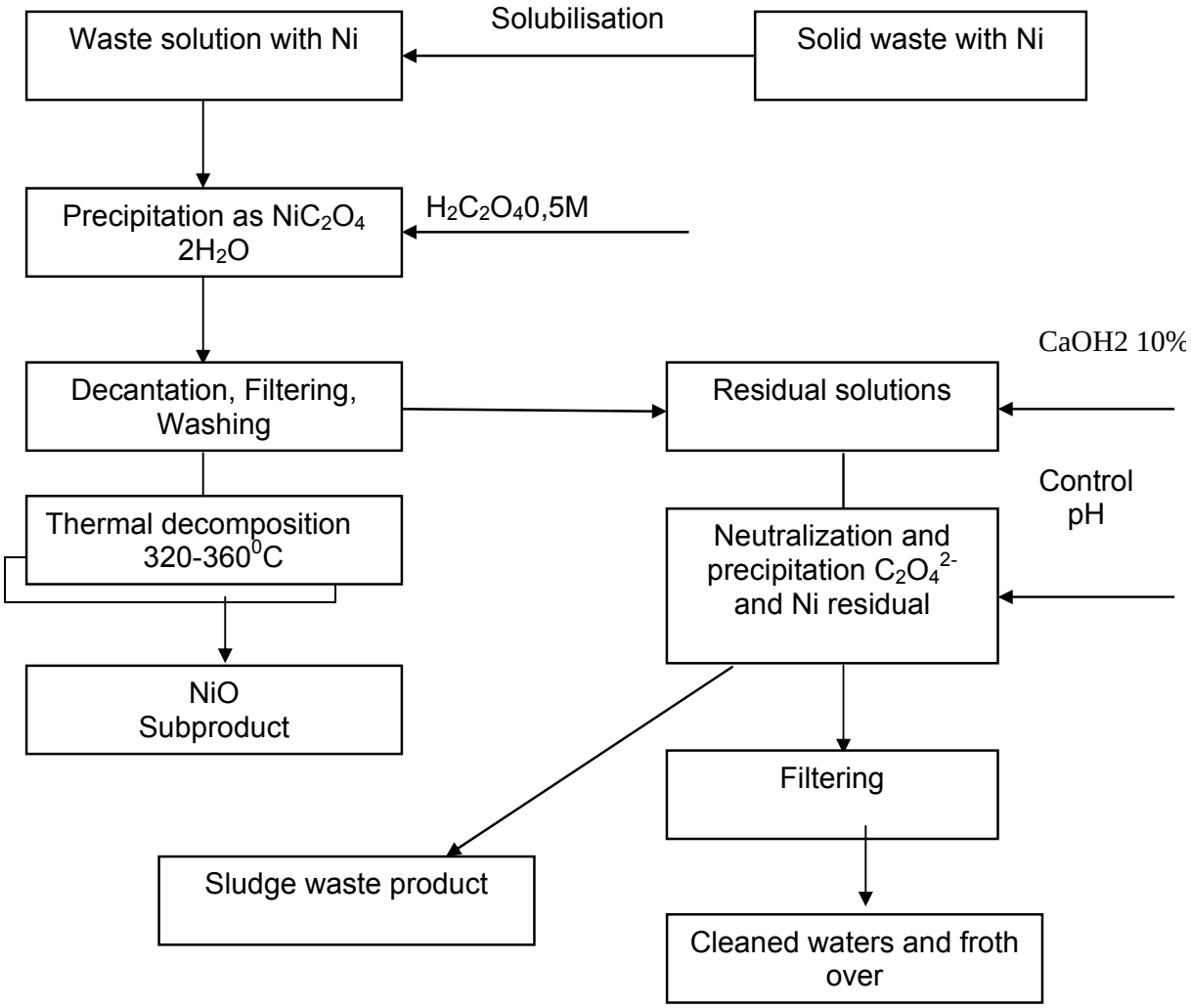

Figure 2.

4.CONCLUSIONS

The nickel recovery ions process, goes with 98,55% efficiency in the fallowing optimal conditions: nickel ions contents {Ni} ≥ o,o2M, pH=4,5, oxalic acid excees100%, T=80^{0}C. Decomposition of nickel oxalate to NiO, is demonstrated by TTA (320-360^{0}C). These is a low temperature for obtaining NiO, face to another methods, energy consumption.

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