ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 3 , March 2021

Flotation Processing of Graphite ore Using a Local Foamer

Tursunov A.S., Turdialiev U.M.

Doctoral student, Tashkent Institute of Chemical Technology, Tashkent, Uzbekistan
Doctor of technical sciences, Andijan Institute of Mechanical Engineering, Andijan, Uzbekistan

ABSTRACT. Methods of flotation processes in various industries are considered. Including flotation of graphite ore and graphite concentrate. Data on methods of optimization of enrichment processes of graphite raw materials using various types of flotation and flotation reagents are presented. Efficient collectors and foaming agents and the conditions for their use in laboratory research are considered.

KEYWORDS:flotation, flotation reagent, froth flotation, collectors, foaming agent, graphite ore, graphite concentrate.

I. INTRODUCTION

Modern flotation beneficiation is based on the use of flotation reagents (flotation reagents).Flotation reagentsare chemical compounds that promote selective adhesion of air bubbles to mineral particles and the implementation of flotation of certain components.

Foaming agents are organic surfactants that are adsorbed mainly at the liquid-gas interface [1].
Foaming agents UGFA (Universal Graphite Foaming Agent) is the main enrichment agent in the production of pure carbon. There are natural and artificial foaming agents.

Foaming agent molecules are polar-apolar (diphilic). The polar part can be represented by hydroxyl, carbonyl, sulfo group, amino group, etc. This article provides a foaming agent with a sulfo group - alkylbenzenesulfonic acid (ABSA).

II. SIGNIFICANCE OF THE SYSTEM

Methods of flotation processes in various industries are considered. Including flotation of graphite ore and graphite concentrate.The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion.

III. METHODOLOGY

The raw material for the production of LABS is alkylbenzenesulfonic acid (ABSA), which is obtained as a result of the following stages: 1) dehydrogenation of paraffins to obtain olefins on a Pt catalyst; 2) alkylation of benzene with olefins to obtain linear alkylbenzenes (LAB). The process is carried out using an HF catalyst, which is subjected to regeneration in a column-type apparatus; 3) sulfonation of LAB to obtain ABS. LAB itself is not a surfactant, therefore it is subjected to sulfonation by the addition of a sulfuric anhydride SO_3 molecule, resulting in an ABSA-alkylbenzenesulfonic acid according to the formula R $C_6H_4SO_3H$, R=$C_{12}H_{25}$-$C_{14}H_{29}$ [2].

Compositional enrichment of graphite ore bodies of the Taskazgan ore bodies are a complex complex of mineral associations. The bulk of the ore is graphite in various ratios with kaolin, chlorite, serpentinite [3,4,5].

The chemical composition (Table 1) of the provided samples of graphite ore from the Taskazgan deposit in the Bukhara region was studied.

Table 1
Chemical composition of the graphite ore of the Taskazgan deposit

Chemical substance	FROM	Co	Cu	SiO_2	Fe_2O_3	CaO	Al_2O_3
The content of the equipme of substance in%	12 - 51.8	0.009	0.08	33.6 - 35.2	5.3 - 6.1	3.8 - 8.8	9.15 - 12.64

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 3 , March 2021

Other beneficiation methods differ in that the operating conditions are camping harmful to health, high cost, low effective, large power-consuming Stu and loss of graphite portion [6,7,8].

Table 2
Physical characteristics of the UGFA foaming agent

Molecular weight / mol	Color	Phase	pH (1% - hot solution at 25 °C)	Flash point,°C	Density g / cm ^{3} at 25 °C	Solubility	Smell
318-326	brown	liquid	1-2	100	1.05	well soluble in water	Without smell

Recently, a large number of reagents for graphite flotation have been proposed in the world, which are mainly waste and by-products of the oil refining industry and organic synthesis enterprises. When selecting new reagents, considerable attention is paid to their cost, environmental safety and efficiency of action during flotation of refractory types of ores. Proposed a reagent you usually have a collective high and selective properties of wear to graphite. Composition practically all the proposed reagents are very complicated in their include a variety of organic connected in apolar and hetero polar structures. For the flotation of graphite ores from the Taskazgan deposit, the optimal composition of flotation reagents was selected experimentally. For the process flotation used various collectors: kerosene (KE), transformer oil (TO), induction oil (IO), the spent engine oil (SEO) and a blowing agent:

PT - 2, PT - 4, T - 92, SU, UGFA are organic surfactants (surfactants) that help maintain the dispersion of air bubbles and increase foam stability (Table 2). The used foaming agent UGFA is a high molecular weight synthetic modified linear polymer.

IV. EXPERIMENTAL RESULTS

The procedure for performing experimental work when enriching graphite ore on the FML flotation machine:

Pour water into the cell of the flotation machine, add the collector and mix for a specified time, then pour crushed graphite ore into the cell of the flotation machine and mix, add the foaming agent. After activation of the pulp with reagents, start collecting foam using a foam remover into a separate receiver. Maintain the slurry level in the chamber by adding water to flotation lead to full disappear mineralized froth or within a predetermined time.

The test results are shown in Table 3. From these experimental data show that the most optimum and cost effective is a method of enrichment with one Flotation - local foam -forming UGFA, which is still room best results in the course of experimental researches.

Table 3
Influence of collectors and foaming agents in the flotation concentration graphite howling ore deposits Taskazgan Bukhara region

No.	Collector's name	Amount from the picker		Name and quantity of foaming agent		Obtained graphite from 50 g of ore		Wasteland from 50 g of ore	
		a drop	g	a drop	g	g	%	g	%
1	2	3	4	5	6	7	8	9	10
PT-2									
1	KE	4	0.016	10	0.202	29.8	59.6	17.2	34.4
2	TM	4	0.017	10	0.202	30.9	61.8	16.9	33.8
3	THEM	4	0.025	10	0.202	28.7	57.4	17.0	34.0
4	OMM	4	0.100	10	0.202	29.1	58.2	16.2	32.4
T-92									
5	KE	1	0.004	4	0.090	25.2	50.4	22.0	44.0
6	TM	1	0.004	4	0.090	25.0	50.0	23.8	47.6
7	THEM	1	0.006	4	0.090	23.6	47.2	25.2	50.4
8	OMM	1	0.025	4	0.090	24.9	49.8	22.8	45.6
PT-4									
9	KE	4	0.016	10	0.202	26.3	52.6	22.5	45.0
10	TM	4	0.016	10	0.202	25.4	50.8	21.9	43.8

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 3 , March 2021

11	THEM	4	0.016	10	0.202	24.7	57.4	18.8	37.6
12	OMM	4	0.016	10	0.202	25.1	50.2	23.8	47.6
SU									
13	KE	1	0.004	9	0.200	23.6	47.2	24.1	48.2
14	TM	1	0.004	9	0.200	22.9	45.8	24.8	49.6
15	THEM	1	0.006	9	0.200	20.4	40.8	27.3	54.6
16	OMM	1	0.025	9	0.200	23.1	46.2	25.1	50.2
UGFA									
17	KE	4	0.016	5	0.120	24.000	48.0	22.1	44.2
18	-	-	-	1	0.024	37.800	75.6	9.6	19.2

It was found that when a collector (kerosene) was introduced into the pulp, and then after the pulp was activated with the addition of the UGFA foaming agent, much less foam was collected on the surface than in comparison with other foaming agents. Would l conducted ex to experiments graphite ore flotation with foaming agent UGFA without applying a collector, which showed a positive effect on foam amount and the output of the graphite concentrate, from which it follows that the collector in this case itself as a defoamer.

The results obtained allow us to draw the following conclusions:

- at flotation concentration, where the combination of flotation reagents: KE (4 drops) + foaming agent PT - 2 (10 drops), the consumption of foaming agent PT-2 was from 2.5 - 3.0 kg/t, and the consumption of the collector (kerosene) was 0.5 kg/t.

- in the flotation beneficiation, which is used only one local, foaming agent UGFA consumption of it ranged from 0.70 - 0.85 kg/t, etc., and it is necessary to take into account that flotation is carried out by a single foaming agent UGFA without collector. This gives us the right to call it a universal local reagent.

The use of this technology and a local reagent makes it possible to save financial costs for chemical reagents, reduce the flotation time, reduce the cost of using energy resources, and reduce the labor intensity of the technological process.

During the experiments, modern methods of studying samples were used, such as electron microscopy (Fig. 1, 2), IR - spectral analysis (Fig. 3, 4).

Fig. 1. Snapshot of a graphite ore sample at 100x magnification

Fig. 2. Snapshot of a sample of graphite concentrate at 100-fold magnification.

The images were taken on an AvikonTex XPC- 500 E microscope. The image shows inclusions, which indicates that this sample of graphite ore consists of graphite, quartz, iron, aluminum and other ballast impurities.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 3 , March 2021

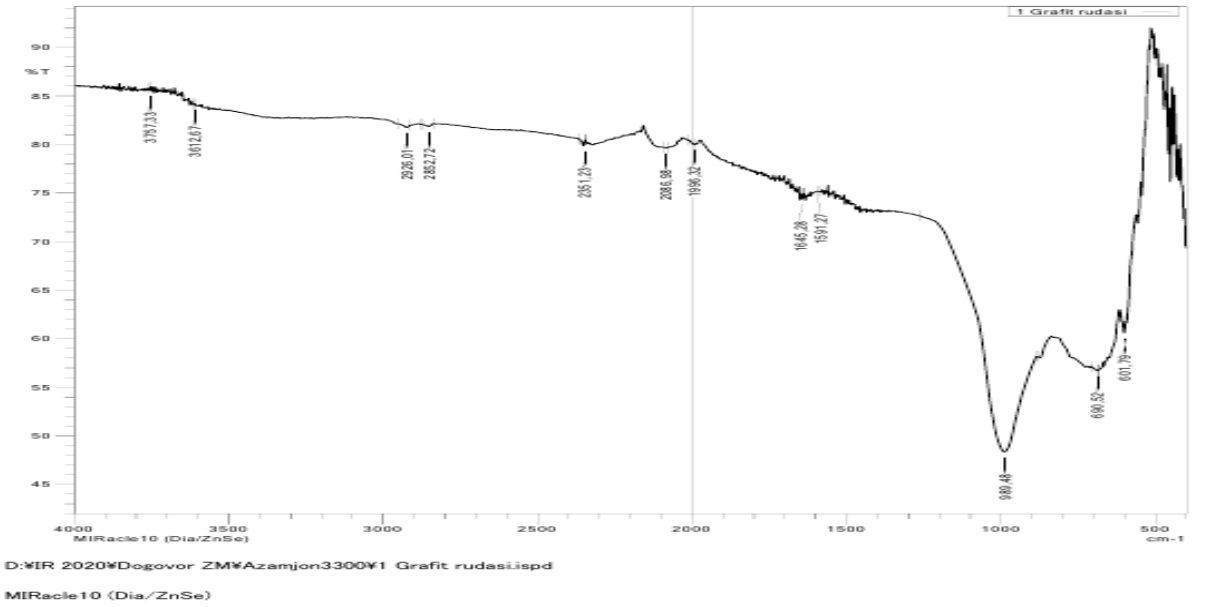

Fig. 3. IR - spectrum of graphite ore

In fig. Figure 3 shows the IR spectrum of the graphite ore of the Taskazgan deposit, which is characterized by the following absorption frequency regions: oxygen compounds - C-O (bands 989.6 - 989.24 cm $^{-1}$); aromatic compounds - C = C (lanes 1 648,16 - 1642,32 cm $^{-1}$).

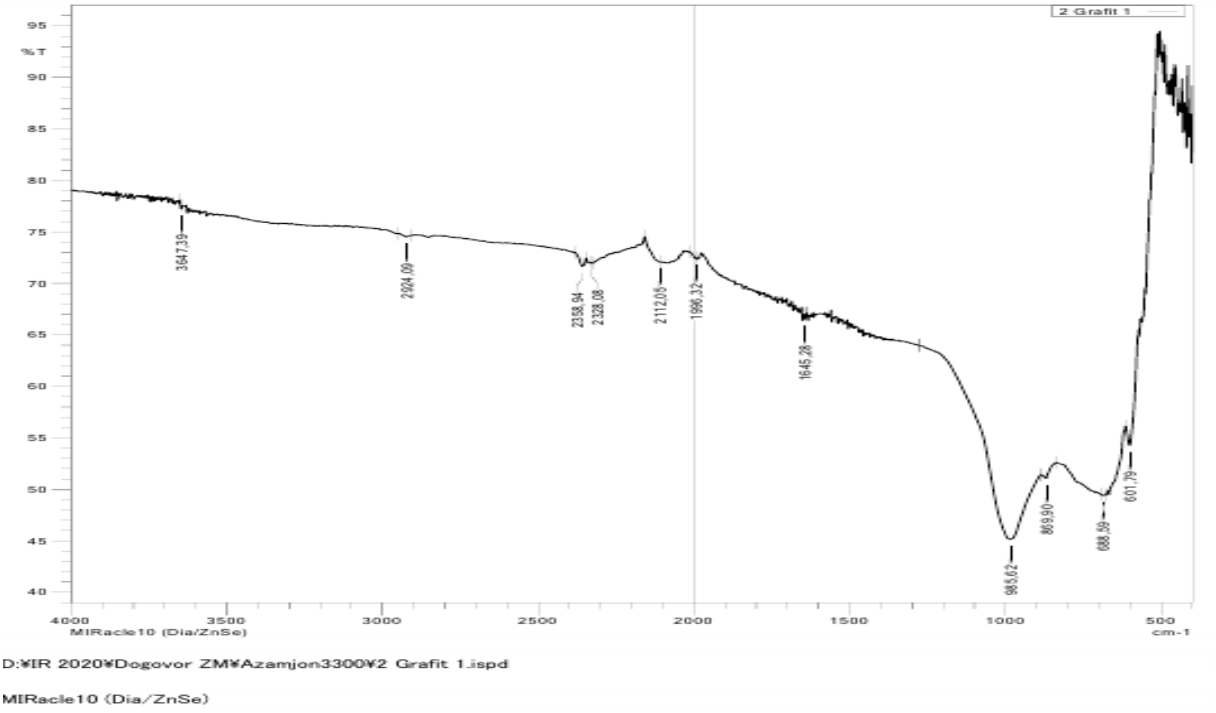

Fig. 4. IR - spectrum of a sample of graphite concentrate after enrichment with a local universal foaming agent UGFA.

Figure 4 shows a snapshot of the sample graphite concentrate, which on is observed a significant reduction in amount of inclusions, which tells of the fact that the concentrate visually predominates graphite, and the amount of ballast admixtures contracted.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 3 , March 2021

V. CONCLUSION AND FUTURE WORK

The results of scientific research presented in this article allow us to draw the following conclusions:

- by the method of foam-air flotation, the highest yield of graphite concentrate from graphite ore is achieved ;
- when using the foam-air flotation method in combination with an effective local foaming agent UGFA for the beneficiation of the Taskazgan graphite ores, it is possible to obtain a graphite concentrate with a graphite content of more than 90%;
- the highest yield of graphite concentrate was obtained when using one UGFA foaming agent, which performs the functions of a collector and a foaming agent [9].

REFERENCES

[1]. ShubovL.Ya., Ivankov S.I., Shcheglova N.K. Purpose and classification of flotation reagents. URL: https://zolotodb.ru/article/11969
[2]. A. V. Shandybin.Determination and stabilization of the color of alkylbenzenesulfonic acid.Modern technologies for the preparation and processing of natural resources. Subsection 1. Hydrocarbon raw materials. URL: http://earchive.tpu.ru/bitstream/11683/32031/1/conference_tpu-2016-C11_V2_p584-586.pdf
[3]. Mineral resources of Uzbekistan (part 2).T.: Fan, 1977, -pp.101-104.
[4]. Hamidov R.A. Graphite ores of Uzbekistan and ways of their industrial use // J. “Geology and mineral resources”. -No 2. -2011.-pp.34-40.
[5]. Mineral raw materials base of building materials of the Uzbek SSR // under the leadership of E.I.Semechkina / Tashkent. 1967.
[6]. V.I. Bragin, I.I. Baksheeva“Development of a technology for enrichment of graphite ores” scientific and technical journal “Mining information and analytical bulletin”
[7]. No. 9 pp. 133-137 ed. GornayaKniga CJSC M 2012
[8]. Abdurakhmanov E.A., Doniyarov N.A.A course of lectures on the subject “Technology of enrichment of nonmetallic minerals.Navoi - 2008.-pp. 144.
[9]. Adylov D.K., Akhmedov R.K., Chernichenko N.I., Tursunov A.S. Local universal foaming agent (surfactant) for flotation concentration of graphite ore from the Taskazgan deposit. // Collection of works and the international Uzbek-Kazakh symposium “Actual problems of the development of chemical science and industry” Tashkent-2019. –pp.166-171.