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RESEARCH WORK OF THE IMPACT OF THE PULP AGITATION FLOATATION SPEED AT DIFFERENT DENSITY ON ADSORPTION OF SULPHO HYDRILLIC COLLECTORS

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ABSTRACT
Xanthate with different length of hydrocarbonaceous radical is the main collector used in selective floatation of sulfide minerals. Basic interaction of sulfide minerals with collector takes place in a process of agitation of the stirring agitators. This interaction basically depends on the density of floatation pulp. This research work is devoted namely to this problem.
Key words: floatation, xanthate, pulpdensity, stirring velocity.

INTRODUCTION

Selective floatation of the mineral grains runs effectively under strictly determined pulp density. This density provides several principle conditions for normal flowing of mineral floatation, as well as the appropriate selectivity of the process. High content of hard phase in the floatation pulp ensures necessary probability for meeting the mineral with air bubbles, however it hinders saturation of the pulp with air bubbles. Low content of hard material in the pulp allows high airing of the pulp but intensifies all oxidizing processes. Thus the content of the hard phase in the floating pulp is an optimal quantity, which leads to the achievement of utmost technological results. Its determination more often is performed in experimental way and depends on:

1. mineral content of the floating raw material;
2. required extent for grinding;
3. Relative density of minerals
4. Availability of initial middling slimes in the ore;
5. Used floatation reagents;
6. Accepted technological scheme;
7. Constructive specification of used machines;

This research work has the limited task to verify the possibilities for improving selectivity of division of materials at high content of hard phase in the floatation, pulp as the main obstacle of the dense pulp is diminished selectivity in division of materials through floatation. Usually the pulp density during the process of selective floatation is identical to the pulp density in the process of agitation, or more properly, the pulp density in agitation of mineral grains with floatation reagents are determined by the required density for successful realization of selective floatation of minerals. In certain technological cases successful selective floatation can be realized only if the agitation with floatation reagents has run at certain density. This is the case with the selection of mica and fluorite (50% hard content during agitation) while cleaning the feldspar (60-70% hard content during agitation) etc.) In dense pulp physically adsorbate reagents on certain minerals are rubbing around and the reagent is concentrated on the minerals where setting firmly of the reagent is hemi-absorbent. This increases the difference between floatation capacity of the two divided minerals. After agitation the pulp is diluted and floatation is carried out at lower content of hard phase in the pulp. All this leads to the necessity of independent study of the possibilities for agitation in dense pulp and particularly the speed of agitation of mineral particles in a dense pulp on the selectivity of consequent process of floatation of the mineral grains.

By increasing agitation velocity the quantity of drained in air through the open surface inevitably grows. Around the shaft of the propeller for stirring the pulp due to the rotation of the shaft and the movement of the layers of fluids a cone is set up which is as big as the bigger is the stirring of the shaft velocity and lower is the pulp density. Thus the bigger is the stirring velocity the higher is quantity of existing oxygen contained in pulp with certain density as a component of the air.

This explains the direct dependency of the speed of pulp agitation at certain level of hard content on the oxidizing processes, which are taking place in it.

Methods of research performance

We have studied through residual concentration of xanthate in the liquid phase of pulp measured in UV area at 301 nm the intensity of oxidizing at different agitation velocity and different pulp density. The velocity of rotation and percentage of hard content in the pulp have been changed. The density of the pulp expressed in percentage of the hard phase was provided

through ground quartz, class – 0,2 + 0,04 mm. A sample of double purified through spirit solution isobutylene xanthate was used as xanthate is used at concentration of 100 mg/l. Calibrated curve line of the xanthate concentration in mg/l and the extinction of UV peak at the ray length of 300nm.

..Apart from oxidizing processes velocity of agitation of minerals with floating reagents has impact also on the rubbing of the surfaces of the minerals attached by adhesion to the mineral surfaces reagents, products of the oxidizing processes and middling slime particles. To find out the essence of these processes three sets of tests have been carried out. First series of test accounts for the possibility at high content of hard phase in the pulp and high agitation velocity to get removed from the mineral surface physically adsorbed floatation reagents. To this end it was chosen pure chalcopyrite and de-xanthate.

Quantity of desorbed xanthate was measured in mg/l through UV spectroscopy at 280 nm. To this end a calibrated curve was preliminary constructed between the concentration and the extinction of de-xanthate, received through electric oxidizing of isobutylene xanthate.

Achieved results and discussion

Results of performed tests of the study of impact of the density of floatation pulp and the agitation velocity on the oxidation of the xanthate at its agitation with mineral suspension are shown on figures from 1 to 6. Results of the tests for finding the role of stirring velocity at the agitation on desorption of the xanthate from mineral surface are shown on figures from 7 to 9. Quoted results displays as follows:

1) By increasing time of agitation desorption grows.
2) By accelerating agitation velocity desorption grows.
3) At equal time and velocity of agitation increased density accelerates desorption by 50% and after that level it practically does not have any effect. This is due most probably to the balance of accelerating and retarding factors of desorption. When the pulp density is increased the number of blows between the particles for a unit time grows and thus desorption of collector is accelerated. At the same time at equal velocity of pulp agitation less quantity of oxygen is dissolved calculated per 1 cm^2 division surface and therefore the oxidizing processes on the mineral surface are delayed. Bigger mineral division surface per volume unit of floatation pulp leads to more intensive oxidizing of the surface of sulfide minerals and this helps building up more reducing environment.

Balancing the running velocity of all these processes leads to certain buffering of the system, which is reflected in studied dependence.

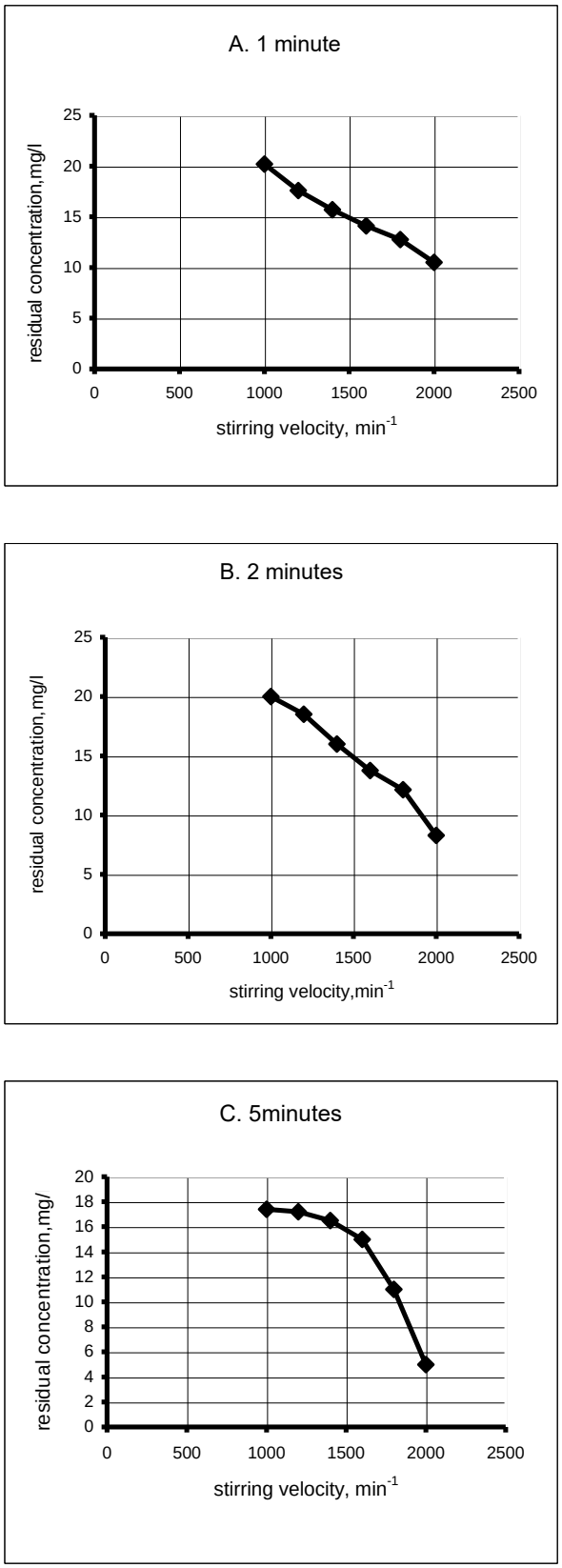
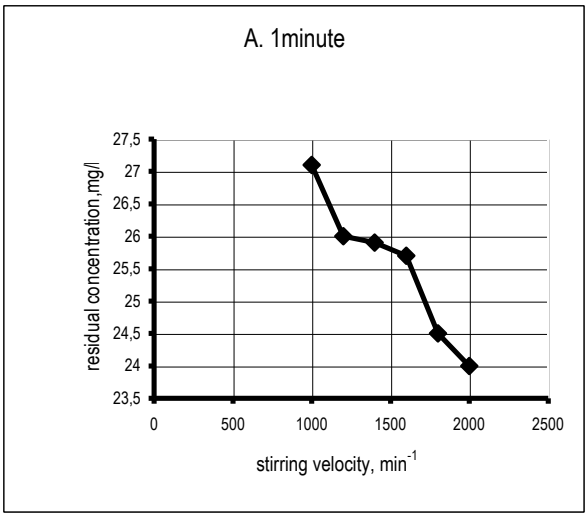
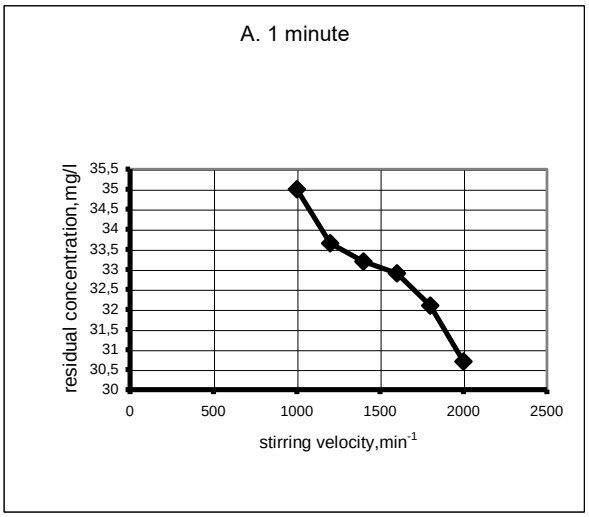
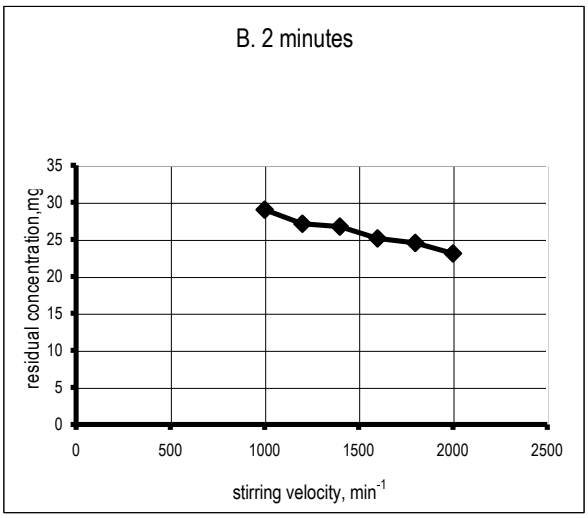
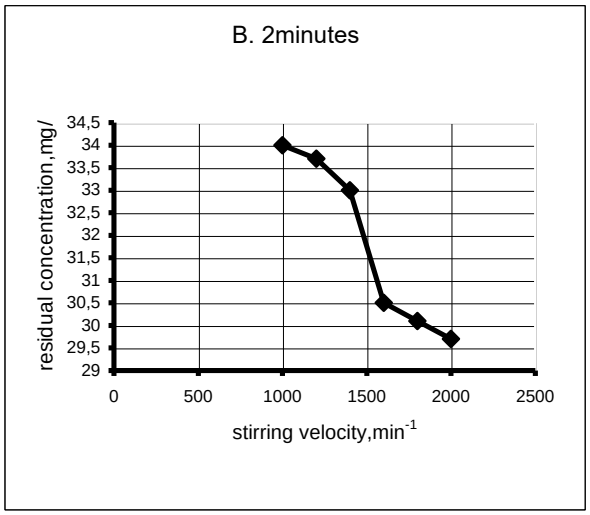


Figure 1. Influence of the stirring velocity on the oxidizing processes in the floatation pulp at density of the pulp 10%.









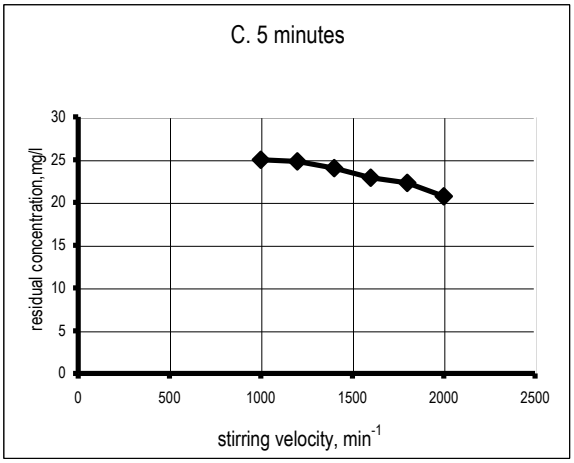


Figure 2. Influence of the stirring velocity on the oxidizing processes in the floatation pulp at density of the pulp 20%

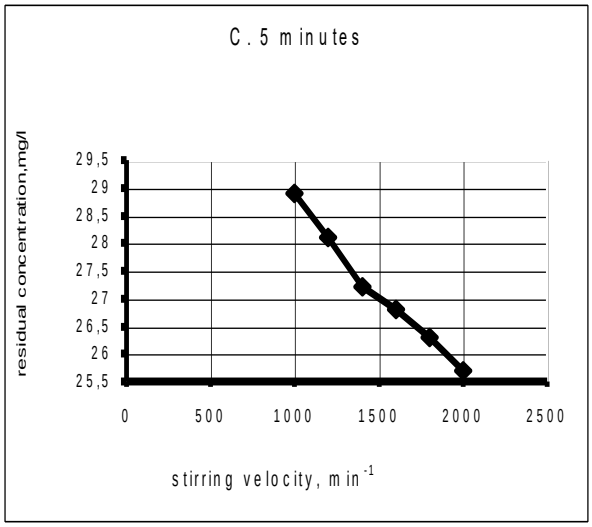
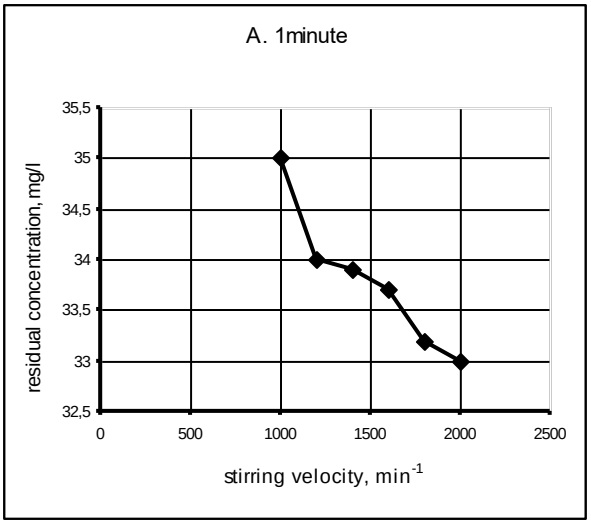
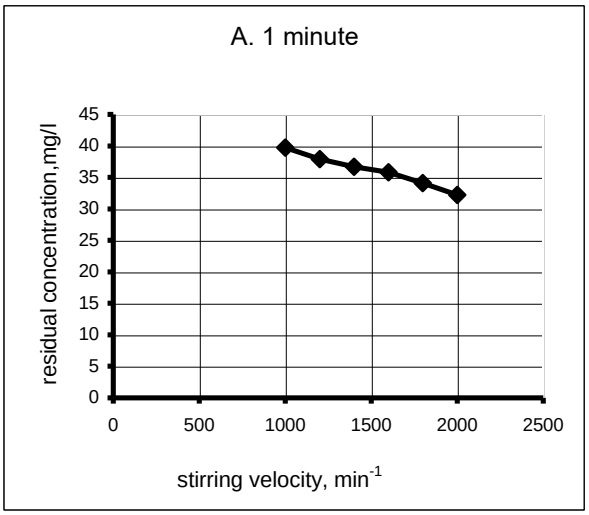
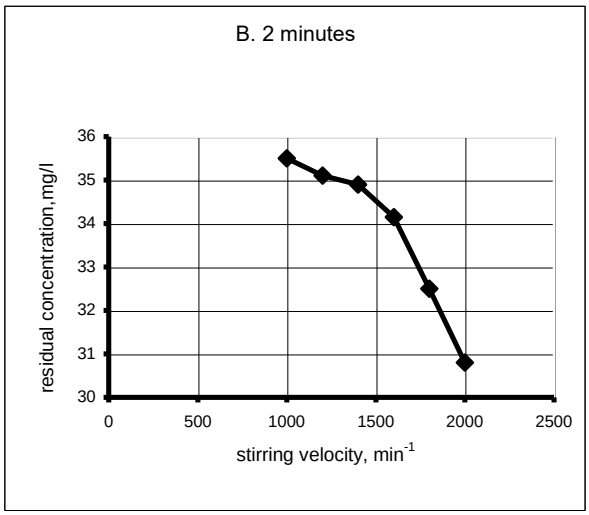
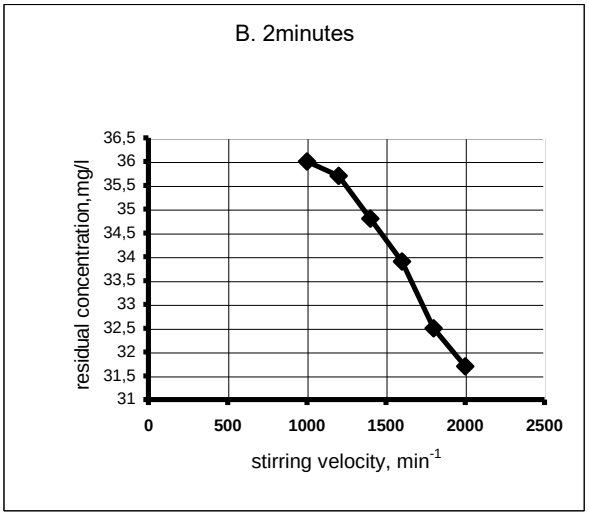


Figure 3. Influence of the stirring velocity on the oxidizing processes in the floatation pulp at density of the pulp 30%









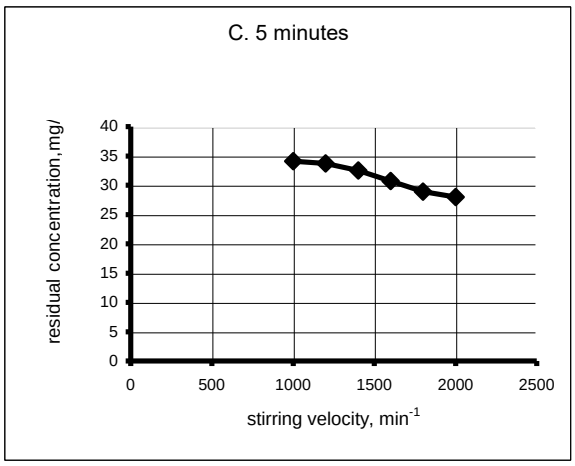


Figure 4. Influence of the stirring velocity on the oxidizing processes in the floatation pulp at density of the pulp 40%

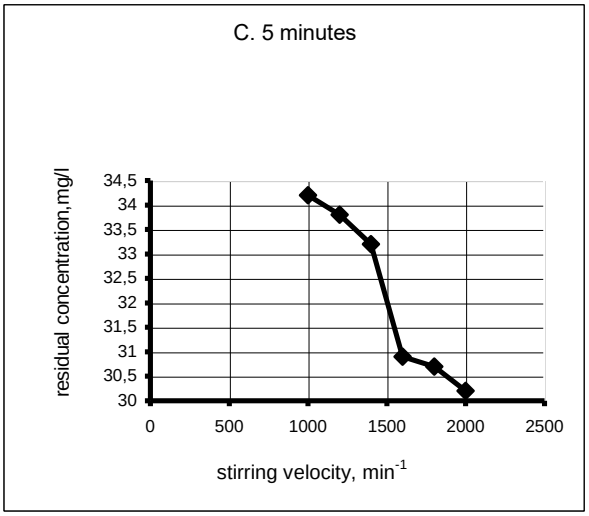
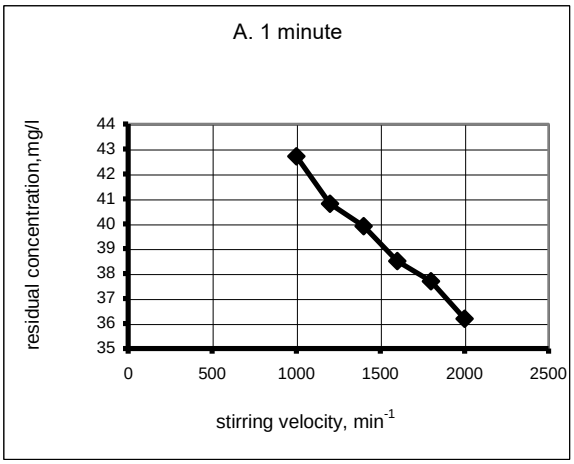
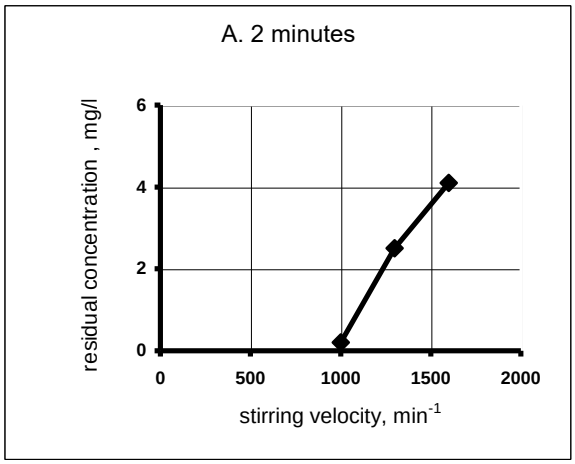
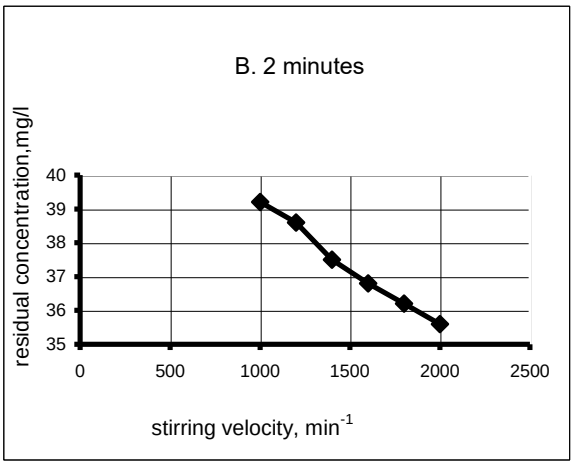


Figure 5. Influence of the stirring velocity on the oxidizing processes in the floatation pulp at density of the pulp 50%







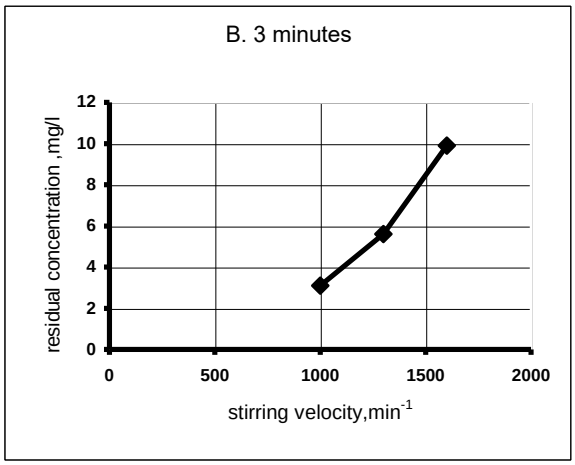


Figure 7. Desorption of the de-xanthate from the mineral surface in conditions of the density pulp with increased stirring velocity at density of the pulp 40%

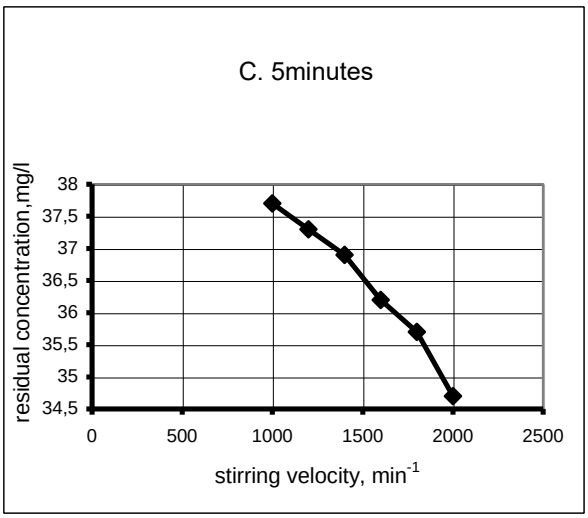
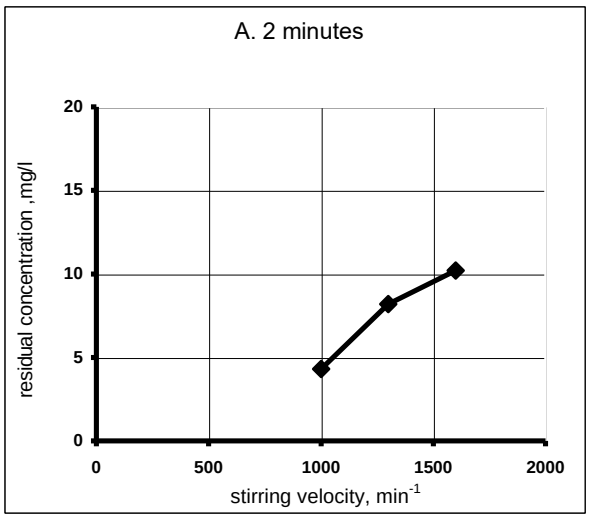


Figure 6. Influence of the stirring velocity on the oxidizing processes in the floatation pulp at density of the pulp 60%



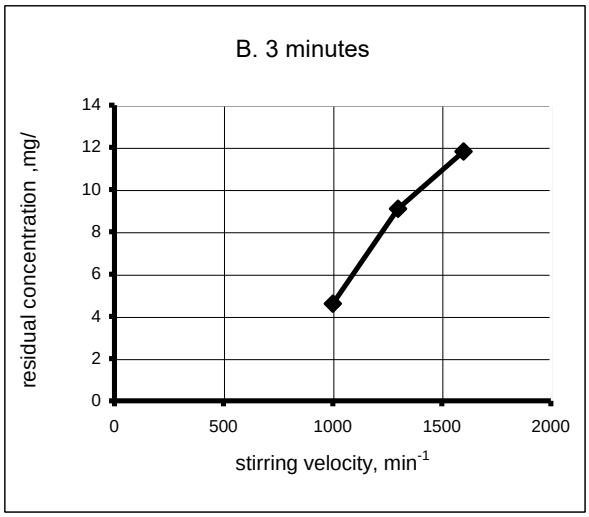


Figure 8. Desorption of the de-xanthate from the mineral surface in conditions of the density pulp with increased stirring velocity at dencity of the pulp 50%

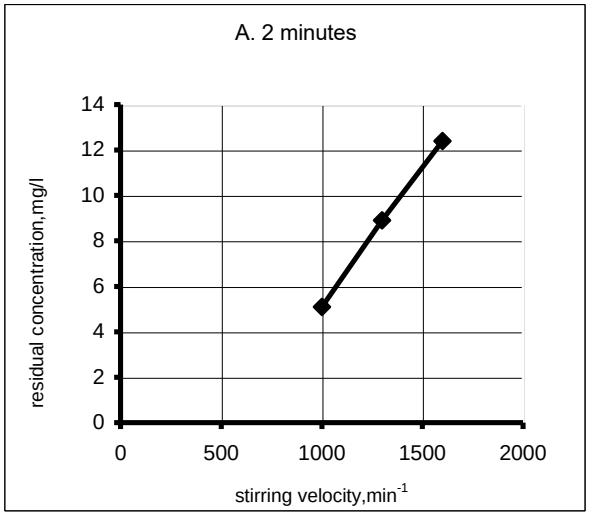


Figure 9. Desorption of the de-xanthate from the mineral surface in conditions of the density pulp with increased stirring velocity at density of the pulp 60%

Final conclusions

1) Stirring velocity of material in the period of its agitation with floatation reagents before entering the floatation machines is an essential factor influencing both effectiveness and selectivity of the next floatation process.

2) In case of low density of the pulp (up to 30% content of hard phase) acceleration of stirring velocity mainly leads to intensification of oxidizing processes. At pulp density over 30% hard content the process of mutual rubbing of mineral grains of one another is starting to play the dominant role.

3) In case of low density of the pulp over 40% hard content and velocity of 1600 min^{-1} desorption of attached by adhesion on the mineral surfaces oily reagents is possible.

4) Agitation at high velocity and pulp density is one of the ways for improving selectivity of the floatation process through reduction of the quantity of physically adsorbed collector on the less hydrophobic mineral.

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