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ANALYSIS OF BISCHOFITE DRYING CURVES

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ABSTRACT: *This study presents the obtained drying curves of bischofite under low-temperature infrared drying conditions. Additionally, an analysis of the drying curves is provided.*

KEY WORDS: BISHOFITE, DRYING, DEHYDRATION, KINETICS, DRYING CURVES, KINETIC RULES

АНАЛІЗ КРИВИХ СУШІННЯ БІШОФІТУ

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АНОТАЦІЯ: *У даній праці представлено отримані криві сушіння бішофіту за низькотемпературного сушіння інфрачервоним випромінюванням. Також наведено аналіз кривих сушіння.*

КЛЮЧОВІ СЛОВА: БІШОФІТ, СУШІННЯ, ДЕГІДРАТАЦІЯ, КІНЕТИКА, КРИВІ СУШІННЯ, КІНЕТИЧНІ ЗАКОНОМІРНОСТІ

To determine the feasibility of drying bischofite using infrared radiation and to provide practical recommendations, it is necessary to establish the kinetic regularities of this drying method. This requires identifying the influence patterns of various factors on the drying process, particularly heat flux density and initial moisture content. Therefore, the objective of this study is to determine the kinetic

regularities of the infrared drying process of crystalline bischofite, specifically by constructing drying curves and analyzing them.

It is known that at drying temperatures above 90–100 °C, bischofite begins to lose crystallization moisture. Specifically, $MgCl_2 \cdot 6H_2O$ crystals start transforming into the $MgCl_2 \cdot 4H_2O$ form, losing two water molecules. In some cases, to increase the yield of dried bischofite while preserving the crystal structure, it is sufficient to remove only the surface moisture, which exists as a thin film. That is, the dehydration process consists solely of drying the surface moisture without the dehydration of crystallization water.

During the study of bischofite drying processes using infrared radiation under low-temperature conditions, drying curves were obtained. The surface temperature of the material ranged from 70 to 90 °C. The heat flux density from the emitter to the bischofite surface was 0.9 kW/m², 1.2 kW/m², and 1.45 kW/m².

The obtained bischofite drying curves are shown in Figure 1.

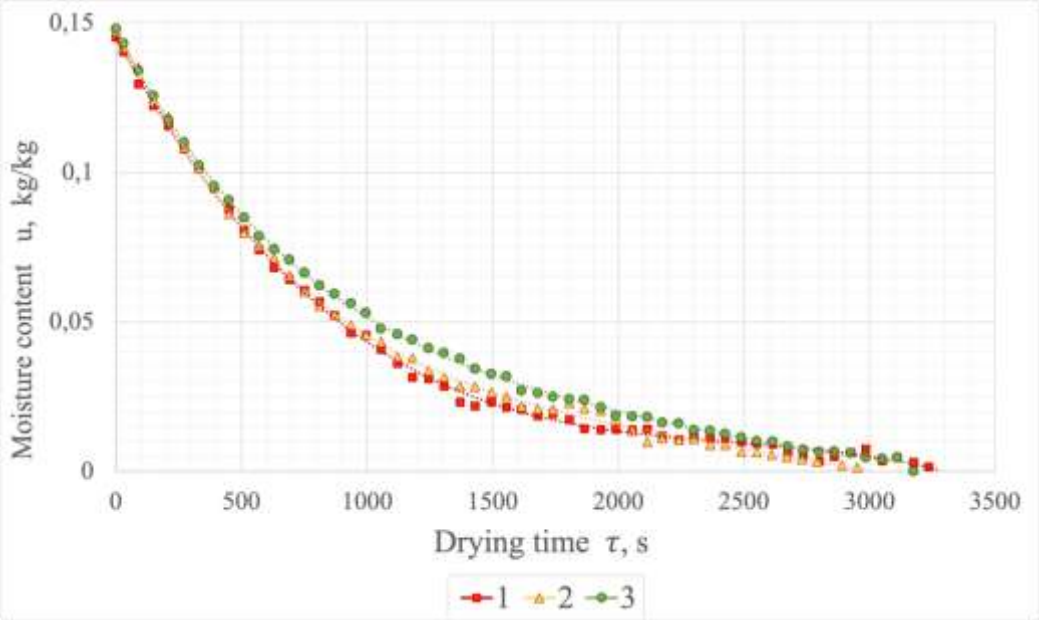

Figure 1 – Drying curves of bischofite using infrared radiation

As seen in Figure 1, the drying curves of bischofite under low-temperature infrared drying conditions are characteristic of crystallized

materials. At the beginning of the drying process, no heating period is observed. This is due to the high intensity of surface moisture heating caused by infrared radiation.

Additionally, the absence of the first drying period can be noted, as the drying curve does not exhibit a linear dependency. There is an observable increase in the intensity of the drying rate decline. However, up to 500 seconds from the start of drying, this decline remains insignificant, and the dependence of bischofite moisture content on drying time is close to a linear relationship.

With an increase in heat flux density, the intensity of moisture removal also increases, leading to a higher drying rate. However, at the final stage of drying, the heat flux density has minimal influence on the drying intensity. During this phase, moisture removal occurs in the deeper layers of the material, and the drying rate becomes limited by other processes unrelated to the heat flux density.

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