INFLUENCE OF THERMAL EXPOSURE TO THE BLOCK SIZE AND INNER MICROINTENSITY OF DOLOMITE

Terentyev A.V., Kablis G.N.
Institute of Geology of Komi Science Centre of the Ural Branch, Syktyvkar, Russia
teren@geo.komisc.ru

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It's known that a single grain of a mineral aggregate can have its own proper substructure, consisting of independent blocks (or subgrains), separated from each other by the small-angle boundaries [1]. Moreover, in every subgrain there is a possible occurrence of inner microintensities. It is traditionally assumed that if an initial sample contains microintensities its subsequent heating should provide relaxation, but a gradient of intensity should decrease. This position is basic for modeling of statistical recrystallization, which includes plastic deformation and finally annealing. As a result of this, substructure change of crystalline aggregates is of interest at annealing. One of the methods of determination of characteristics of substructure is X-ray diffractional method.

To study transformations of aggregates of dolomite depending on temperature exposure we made annealing under conditions of atmosphere pressure in the interval of temperatures 20-500^{0}C. Samples of dolomite are cubes with edge 1.5cm. Annealing was in the ovens of resistance during 48 hours, temperature was kept ± 5^{0}C.

X-ray diffraction survey was carried out by diffractometer DRON-2 using CuK_α –radiation. Study of blockness and inner intensities of mineral aggregates was made using usual technique based on variations of half-widths of diffractional peaks [2]. To solve the given task reflections of various orders of one system of crystallographic planes are commonly selected, in our case the orders are (006) and (00.12).

To obtain numerical values of deformation $\Delta d/d$ and sizes of the subgrains L it is necessary to use a pattern with minimal microintensities and linear sizes of blocks in crystals less than 10^{-5}m. But as there is no certainty that the pattern we used meets the conditions we can only say about a quantitative change of desired values depending on temperature. As it occurred the character of temperature dependence remains stable when comparing the half-widths of the peaks of the pattern with the corresponding peaks of the studied samples for 10÷30%. The results are shown graphically in fig. 1, 2.

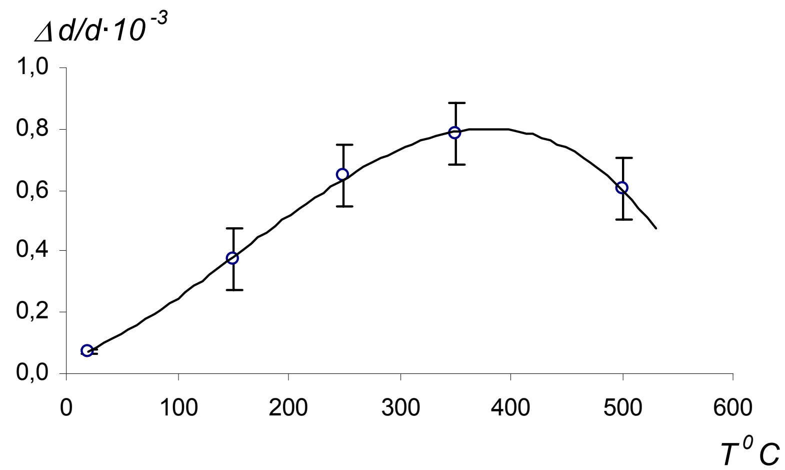

Fig.1. Temperature dependence of the value of microintensities of the dolomite.

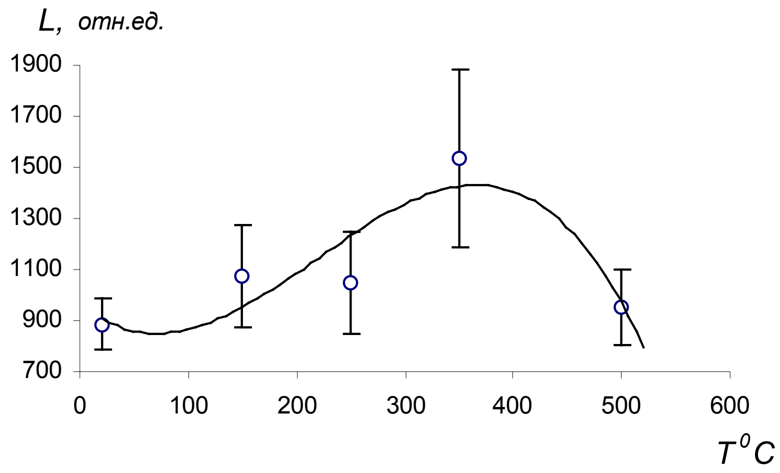

Fig. 2. Temperature dependence of the size of the subgrains of the dolomite

Gradual increase of both intensity value and the subgrains size are observed up to temperature 350^0C. The ratios of the half-widths of diffraction peaks are the evidence that microintensities make a basic contribution in increase of temperature up to 350^0C. Then, in the sample annealed at 500^0C, $\Delta d/d$ and L decrease. It should be taken into consideration that the given sample changes color into a lighter color. It is expected that at higher temperatures during the given time the effect of removal of the inner microintensities is more significant; the block size is seemed to decrease up to the temperatures, corresponding to phase variations and destruction of the matter structure.

Basing on the obtained results it is possible to make a conclusion that annealing of the dolomite at certain temperatures and annealing time may not resulted in removal of intensities, but on the contrary, it is accompanied by the increase of the rest inner intensities of the crystalline structure. It seems that this effect is the result of anisotropy of a thermal extension, and correspondingly, of such intergrain influence when every indivudual surrounded by the neighbours can't change its parameters in the corresponding crystallographic directions with ease.

The observed relative increase of the sizes of the subgrains is the response reaction of a mineral aggregate on the deformation and the bend of the crystalline lattice. The subgrain growth is determined by the tendency of the aggregate to remove intensity. The removal of the intensities is produced at the expense of that the growth of the crystallite boundary moves at the direction of large density of the defects and remains a relatively perfect material to be resulted in a radical decreasing of a number of crystalline defects.

References

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