THE CATALYTIC FUNCTION OF KIMBERLITE ELEMENTS IN THE FORMATION OF NATURAL DIAMONDS.

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Taking into consideration the laws of catalytic transformation of diamond /1/ and also taking into account data of catalytic polycondensation of simple carbon-containing substances we propose a model of kimberlite diamonds formation from simple carbon-containing substances (for example, $CO+H_2 \rightleftarrows C_{diamond}+H_2O$). The most important parameter of this model is the catalytic activity of medium which determines both the growth rate and oxidation-dissolution rate of diamond.

We obtain data about the catalytic nature of diamond oxidation-growth processes, role of surface chemical state in these processes and catalytic activity of certain elements in diamond oxidation by water and carbon dioxide which are natural oxidizing agents of diamond.

Our investigations show that the catalytic activity of ions is determined by their chemical nature, valence state and structural accordance of ionic radius to crystalline chemical parameters of diamond planes.

The latter factor is responsible for the differences in rates of catalytic oxidation of different planes and for variation of habitus of crystals in this process. So, the diamond oxidation by water vapor (900°C) in the presence of the Fe(III) ions leads to gradual transformation of octahedral crystals into dodekahadral ones.

It is shown that catalytic activities of a number of natural minerals are similar to those of corresponding oxide mixtures. This makes it possible to model catalytic activities of natural objects. Alkaline melts of kimberlites are also catalytically active in diamond oxidation, the mean catalytic activities of kimberlites from various deposits being different.

The fact that all etched pictures on natural diamonds including the rare ones were reproduced in laboratory proves the possibility of catalytic oxidation of diamond crystals during the formation of kimberlite tubes.

In our opinion the existence of mineral coats on the diamond crystal, their mineral, chemical, isotopic composition and morphological peculiarities confirm the catalytic function of kimberlites in the formation of natural diamonds.

The suggested model of the formation of diamonds is fur-

ther supported by the established connection between the diamond content of kimberlites and their chemical composition and catalytic activities in diamond oxidation and by irregularity of distribution of diamonds along the tube.

This has enabled us to suggest a physico-chemical criterion for valuation of diamond content in kimberlites.

/1/ Rudenko,A.P., Kulakova,I.I., and Shturman (Skvortsova) V.L. 1978. The oxidation of natural diamonds. New data about minerals of the USSR, 28, 105-125.