Contact mineral phenomenon on the example of Pobuzhskiy granulite complex (Ukrainian Shield)

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The schists of the Salkivska suit from the Pobuzhskiy Granulite Complex (Ukrainian Shield) were investigated in this work. Their approximate modal composition according to optical microscopy data is the following: amphibole 40 vol%, plagioclase 35 vol%, orthopyroxene 15 vol%, clinopyroxene 10 vol% (Fig.1).

Scanning electron microscopy and microprobe (EDS) analysis were carried out at the Geological Faculty of the Kyiv National University of Taras Shevchenko. The used accelerating voltage was 20kV, the element detection limits were between 0.01-0.1 wt%, the error measurement accuracy was 2-10 rel%, while the spatial resolution was 5-10 μm.

The research was done on the mineral boundaries of orthopyroxene and clinopyroxene along a profile (Fig.2).

The results of studying the orthopyroxene/clinopyroxene boundary demonstrate zonality of the composition of these minerals (Fig. 3.). We assumed, that this zonality has caused by amalgamation of mating flanks of orthopyroxene and clinopyroxene (OPx-CPx). Weight parts of each phase within each zone have been estimated using the following formula:

$$a_1 = \frac{Ca_{1-2} - Ca_2}{Ca_1 - Ca_2},$$

where, Ca_{1-2} is the measured content of CaO on the "shelve"; Ca_1 and Ca_2 are the evaluated contents of CaO in orthopyroxene and clinopyroxene, respectively. The contribution of the OPx and the CPx on the "shelve" was estimated using the following formula:

$$C_1^* = C_1 \times a_1;\ C_2 = C_1 - C_1^*$$

where, C_1 is the wt% of oxides in the OPx.

The efficiency of the accepted model is confirmed by the coincident of the measured and the evaluated values of oxides in the orthopyroxene and the clinopyroxene (Fig. 4.).

Calculation of the formation temperature of the current mineral association has been made by the program QUILF. Input data were proportions of minerals X(En) and X(Wo). We made estimates in different ways: 1) using minerals of OPx and CPx from the peripheral parts; 2) using minerals of OPx and CPx from the inner zones; 3) using minaerals of OPx and CPx, that have been calculated above.

In the first case, we got a temperature about 650˚C, in the second case, 1500˚C was calculated, while in the third case, a formation temperature of 620˚C was got.

The similarity between the first and third cases has evidenced the reality of the accepted model about the paragenesis of the examined minerals.

However, the fact of the presence of such "shelves" requires additional research.

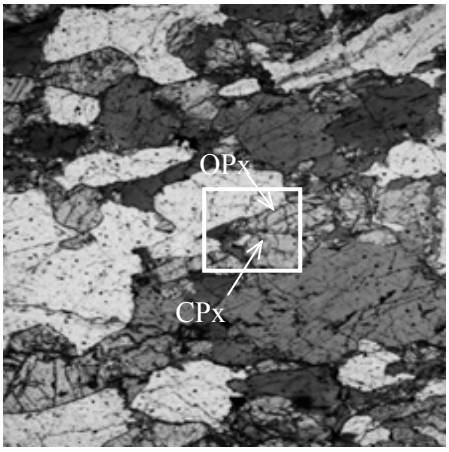

Fig. 1.: Image of t amphibole-plagioclase-two pyroxenes schist in thin section (PP).

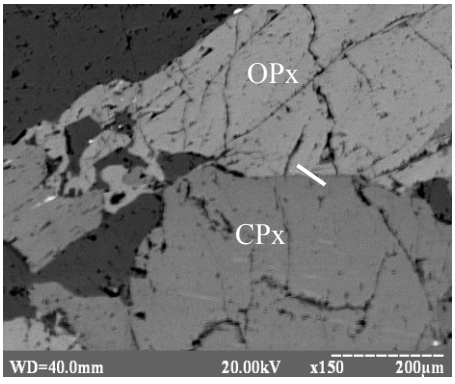

Fig. 2.: Microprobe image (BSI) of the investigated area. The analysed profile (see Fig. 3.) is shown with a white line.

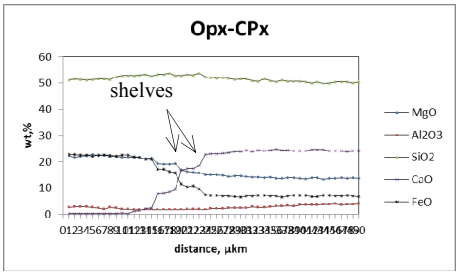

Fig. 3.: Composition of the OPx (left part) and the CPx (right part)

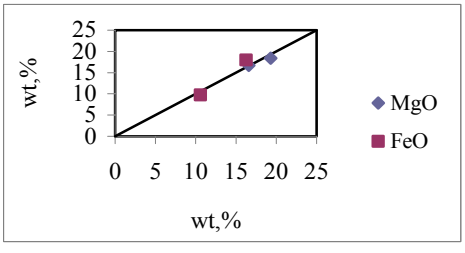

Fig. 4.: Comparison of the measured (x) and the evaluated (y) contents of the oxides in orthopyroxene and clinopyroxene