Opx perlite as frozen facies of crustal melt-the case study of the Earliest Miocene rhyolite, Oga Peninnsula

Masayuki Fukase[1]

[1] Graduate School of Sci. and Tech., Niigata Univ.

It is examined mainly that Opx perlite had been the product as the frozen initial melts originally formed by the crust melting processes, in this case study.

Essencial differences between Opx perlite and Bt rhyolite are detected in terms of field occurrence, rock textures, frequencies, spicies and compositions of phenocrystal minerals, LOL, norm compositions, trace element ratios.

Crystallization of Opx perlite is discussed.

Crutal melting possibility for the Opx perlite is examined.

Fractional melting & aggregation model is applied to explain the disequillibria and disconttinuances on the minerals and bulk variations of Opx perlite.

It is examined mainly that Opx perlite had been the product as the frozen initial melt originally formed by the crust melting processes, in this case study.

In the Oga Peninsula, facing the Japan Sea, there are exposed the Earliest Miocene rhyolitic rocks, that is called as the Shinzan Rhyolite Member. The Shinzan Rhyolite Member is characterized by the lava flows, pyroclastic rocks, epiclastic rocks, a lava dome and simulataneous dyke swarm. It is distinguished that all the these volcanics have the rhyolitic natures in the field. No basic eruptives, such as basaltic lavas and andesitic ones, are found out at the staratigraphic level of the Shinzan Rhyolite Member.

However, the lithologies of the Shinzan Rhyolite Member can be divided into two types. The one is, as the most abudunt facies, crystalline porous rhyolite. The other is, termed as perlite or pitchstone, composed mainly of glassy matrix. It is suggested that the syntetic but the independent magmatic process is requested for resulting each contrasted types of rock from the direct field obsevations, that there are no extraordinal thermal effects at the contacts of the glassy rock and crtstalline rhyolite which is cut by the other type in some cases.

It is sured that these rhyolitic rocks can be subdivided into 6 types in terms of the phenocryst assemblage and the textural aspect under the microscope; the pumiceous Bt rhyolite, A-f Bt rhyolite, Qtz Bt rhyolite, Bt pitch stone, Bt Opx Perlite and Opx perlite. Opx perlite has apearently different petrographic features from that of Bt rhyolite, that is relatively less crystalline and carrying euhedral orthopyroxene phenocrysts.

In the disucussions, it is, at first, developted how the crystallization of the Opx perlite had been proceeding, using mainly the data on the mineralogy, the bluk chemistry and the textual relationships observed under the microscope.

Nextly, it is discussed on the possibility of the crust melting process for the gensis of Opx perlite, comparing with the previous worker's melting experiments on the case of the dehydration melting, whose reaction is expressed by the following equation;

$$Bt + Qtz = Opx + melt (+ K\text{-}f) + H_2O \quad .....(1)$$

In the prevoius discussions, it is shown that some problems are floated in considering the continuous processes for the genesis of Opx perlite. The continuous processes, such as the story that simple melting process had been continuously succeeded the crystallization one, is not acceptable from the evidence of the rere disequillibrium inner-textures of the phenocryst, that is, for example, the dissolved Bt recrystallized, the recrystallization of Pl assosiated with euhedral Opx and ilmenite and the melt inclusion in Pl. The inference from these disequillibrium textures are correspond to the result of the estimationtion on the major element ditribution among the compositions of Fe-Ti oxide, Opx and bulk rock. In addition, the variation diagram of bulk rock chemistry, such as incompatible elements spider patterns and norm ab-or-Q diagram, indicate neither the fractional crystallization nor the bulk mixing process. After that, it is examined the model of fractional melting and aggregation process for explaining the systematic lenear correlations in the x/Y-Ba/Y ratio diagrams (x; arbitary trace elment concentlation). This model, as assuming the simple mass balance equation (1), simulated by the following hypothetical equation;

$$CL = CO * (1-(1-F)^{1/DO})/F \quad .....(2)$$

Here is rearranged for the interesting system into;

C1L/C2L = - a^z * F + a.....(3)

a = C1O/C2O
z = D2O/D1O

It is suggested that examination enable to explain relationships of the actual phenomenon detected from the Opx perlite.

In the conclusion, it is mentioned about the genetic relation with the associated rhyolitic rock and proposed a model on the sub-volcanic system of the Oga Peninsula.

Lastly, the genesis of the Shinzan Rhyolite Member is identified in the geologic scale in the Oga Peninsula.