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The cluster fractal model for layered intrusion genesis

Sobolev R.N.,Volkova E.A.

Geological Department Moscow State University, Moscow, Russia

Nowadays layered intrusions are the subject of research activity due to the fact that they contain a major part of World resources for many elements (Cr, Ni, Cu, *ect.*).Although, it is not fully established yet theorigin of these intrusions and associated with them ore-forming processes. The association of ore bodies with the lower parts of intrusions can results from the differential motion of crystals and liquid under the influence of gravity due to their differences in density. Indeed, ore density is higher in comparison with those of mafic melt. However, this approach cannot explain repeated alternation of plagioclase and pyroxene rich layers, although these minerals exhibit similar density. On the other hand, lattice parameters and consequently volume values differ significantly (Tabl. 1).

Table 1: *Lattice parameters of some rock-forming minerals*

Mineral	*a, Å*	*b, Å*	*c, Å*	*V, Å³*
augit	9.778	8.912	5.340	465.34
hypersthene	18.260	8.855	5.191	839.34
anorthite	8.151	12.849	7.072	664.68

According to recent theories, melt seems to be a mixture of clusters of all sizes, which themselves tend to ordering with decreasing temperature [1-3]. Fractal patterns are typically observed in the systems that develop far from equilibrium. They provide the basis for nucleation and further growth of rock-forming minerals. Large differences in mineral lattice parameters lead to greater mismatch in their clusters and fractals size. Volumes of these particle units in the same system are, therefore, incompatible and melt is considered to be heterogeneous in nanoscale.

From the standpoint of physical chemistry melt separation results from liquation (Fig. 1).

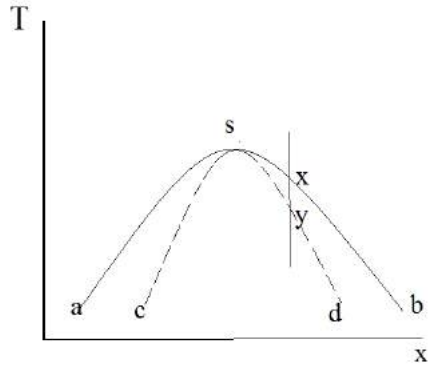

Figure 1: Liquation diagram, where *T*-temperature, *x*-composition, *asb*-binodal, *csd*-spinodal, *s*-critical point, *x* and *y* – figurative points.

Above "*s*" point the existing melt is homogeneous and exhibit high temperature. Within the spinodal melt is always separated. In other words, corresponding melts do not exist.Any system has some volume. However, when analyzing a segregation diagram, the behavior of a point is usually considered. This is a fundamentally wrong approach. The cluster fractal analysis is applicable to any volume. However, it should be taken into account, that the process of homogeneous melt liquation has its own specificity in different nanoscale volumes.

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