DEFINITION OF "PEGMATITIC MACROSTRUCTURE" AND EVIDENCES OF A "SIZE FACTOR" CONTROLLING EVOLUTIONAL PROCESSES IN PEGMATITIC ROCKS

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The concept of *pegmatitic macrostructure* (PM) is a basic instrument for describing the three-dimensional inhomogeneities and for recognizing the evolutional processes characterizing pegmatitic bodies. A PM is defined as the ensemble of the rock structures and rock zones, of a pegmatitic body, formed under the *same* evolutional process.

The *same* evolutional process, in the PM definition, is intended as the sequence of the petrogenetic phenomena able to create typical pegmatitic inhomogeneities starting from a *pocket* of *homogeneous pegmatitic medium*. The word *homogeneous* does not exclude in the pegmatitic medium the limited occurrence of crystals of various solid phases and the occurrence of unmixable *melts* and/or *fluids*.

A PM includes all the rock structures and zones which differentiated participating to the same sequence of crystallization and, on a consequence, which were affected by the same series of geophysical (PTT trajectory) and geochemical conditions (e.g.: closed system conditions; from closed system to various degrees of partially open system; from partially open system to closed system; etc.).

The boundaries of a PM are limited by: metamorphic or magmatic rocks hosting the pegmatitc body; not differentiated unit composing the intrusive body in which the PM formed; boundaries of other PMs occurring inside the same magmatic intrusion.

The studies of the compositional variations of group of minerals forming solid solutions, and/or of the differences in the parageneses of rare accessory phases, are of major importance in the characterization of a PM. Some examples are tourmaline-group, mica-group, Nb-Ta oxides, numerous phosphates, beryllium silicates, scandium silicates, and many others.

The PM concept derives by the necessity of correctly comparing pegmatitic rocks and pegmatitic bodies. The PM concept is based on the large quantity, available in literature, of *descriptions* of the mineralogical, compositional, textural and structural inhomogeneities characterizing pegmatitic rocks, and of *reconstructions* (empiric and experimental) of paragenetic sequences and geochemical evolutions of pegmatitic melts and fluids, involved in the formation of pegmatitic bodies.

The PM concept can be used disregarding for the petrogenetical model considered (magmatic, metamorphic) and for the composition and geochemical affiliation of the studied pegmatitic rocks (e.g. granitic, contaminated, syenitic, peralkaline).

Some pegmatitic bodies, such as much of the *singenetic* pegmatites hosted in shallow depth granites, are composed by a single PM; in such pegmatites the presence of a second and a third PM inside the same body is rare. Typical examples are the pegmatites occurring: in the Baveno granite, Southern Alps, Italy; in the Volodarsk-Volinskiy area, Ucraina; in the South Platte District, Pikes Peak Batholith, Colorado; in the Reformatory Granite, Oklahoma.

Some important examples of *epigenetic* pegmatites characterized by single, well developed, PM are: in the Ilmeny mountains, Russia; the famous Tanco pegmatite, Manitoba, Canada.

Examples of *singenetic* pegmatites characterized by multiple PMs inside the same body occur: in the Zomba-Malosa syenitic massif, Malawi; in the Lagensund fiord larvikites, Norway.

Other pegmatitic bodies, such as many miarolitic gem-bearing dikes, are characterized by multiple PMs of various sizes and various degrees of geochemical evolution. Some examples are: in the Elba island, Tuscany, Italy; in the San Diego County, California; in the Sahatany valley and numerous other localities in Madagascar.

The concept of PM, applied to the study of fields of cogenetic pegmatites, brings to postulate the existence of a *size factor* (SF, ideally a volume factor), able to control the evolutional processes occurred during the crystallization of the pegmatitic bodies; *pockets* of pegmatitic magmas with the same composition and experiencing the same PTT path, but of different volume, generate differently *structured* PMs, more and more complex as larger is the pegmatitic *pocket*.

Comparing PMs of cogenetic pegmatites characterized by similar "external" constraints (among the others, the nature of the hosting rock), as larger is the volume of the PM body, as much the crystallization history of the PM is complex.

Relative to a pegmatite field, some crystallization/solution/reaction/fractionation processes are active only in PM overcoming a certain *critical* volume; below a certain minimum volume no PM develops.

As an example, in the San Piero in Campo pegmatite field, Elba island (Italy), very simple PMs develop in pegmatitic dikes only a few centimeters thick, hosted in monzogranite. Complex PMs with aplitic footwall (layered or not), a strong asymmetric mineralogical differentiation, and the local presence of replacement units, develop in pegmatitic dikes hosted in monzogranite when the thickness of the PM overcomes several decimetres. In the same pegmatite field, in pegmatitic dikes hosted in metaserpentinites no PMs develop when the thickness of the dike is below three to four decimetres.

Further examples can be documented in numerous pegmatitic fields in Madagascar.

In the Itremo region (central Madagascar), in pegmatites hosted in quartzites, only giant bodies (*minimal dimension* in the order of tens of meters) can develop PMs; PMs develop only in large bodies also in pegmatites hosted in marbles, with the exception of tabular-shaped bodies where different types of PMs develop in *thin* dikes (in the order of centimetres) and *thick* dikes (in the order of meters). The crystallization of the famous, multicolored liddicoatite crystals, typical of such pegmatites, is confined to large complex PMs.

In the beryl-columbite pegmatites (with NYF affinities) of the Antananarivo tectono-metamorphic unit (central Madagascar), core-zones composed by high quality rose quartz develop only in large PMs (*minimal dimension* in the order of tens of meters); below a certain minimal volume of the PM, no rose quartz core develops.

The study of pegmatites in term of PM and SF leads to some major stimulating consequences in the prospecting for ore-minerals and gemstones, and in the interpretation of pegmatite classification, probably resulting in a significant simplification.