intracontinental rift–regime is unique within the Avalonian–Cadomian–PanAfrican realm allowing for the first time to give detailed predictions about pre–Hercynian (end–)orogenic geodynamic processes. This fact underlines the importance of the OssaMorena Zone to be one of the particular areas within the Avalonian–Cadomian–Pan–African realm to unravel the Upper Proterozoic–Lower Paleozoic orogenic evolution.

A synthesis of the currently available geochronological data envisages a geodynamic framework for the pre–Hercynian orogenic belt of the Ossa–Morena Zone resulting from a progressive cratonization of a magmatic arc and marginal basin system. According to the petrochemistry of respective granitoids and the nature of associated (volcano)sedimentary successions and related mafic rocks, an active continental margin setting is the most likely geotectonic scenario for the evolution of the pre–Hercynian orogen. The balance of geological evidences, however, does not correspond with classical models of orogenic belts, i.e. where a continent–continent collision with consequent crustal thickening and uplift terrninates an initial stage of oceanic lithosphere subduction and finally leads to a period of stabilized continental lithosphere. The good state of preservation of the magmatic arc, a low metamorphic grade of the pre–Hercynian basement at the present erosion level and absence of thick, late–orogenic molasse–type sedimentary successions argue against a continent–continent collision model including major crustal thickening and high uplift rates. As similarly proposed for other Upper Proterozoic–Lower Paleozoic orogenic belts of the Avalonian—Cadomian—Pan–African realm, a rifted magmatic arc complex therefore mirrors best the geodynamic/geotectonic setting of the pre–Hercynian orogen in the Ossa–Morena Zone. A continuously changing stress regime from cornpressive/transpressive to transcurrent/transtensive tectonism is likely the motive power for the observed sequence of magmatic events. Hence, the cessation of subduction–related magmatic activity is not the consequence of a complete destruction of a former oceanic crust causing a continent–continent collision and crustal thickening but is related to a transition of the compressive setting to an intracontinental shear zone. Although genetically linked to the pre–Hercynian orogeny, magmatic activity of the rift setting and rebuilding of platform conditions mark the inception of a new Wilson cycle.

The lack of a widespread Lower Paleozoic basic magmatism suggests that, subsequent to the ensialic intracontinental rifting episode, no significant oceanization process at the site of previous alkaline magmatic formations occurred. This supports the existence of several distinct minor distensional zones and argues against a concept of large oceanization. Faunal and facies analyses of Lower Paleozoic sedimentary sequences additionally underlined the absence of wider oceanic domains. Recorded faunal similarities provide evidences for the existence of a stable cratonic West European Platform whose intracratonic basins did not act as important faunal barriers. On the contrary, faunal and facies data are indicative for intracontinental rift zones and associated basins to be deep enough to introduce deeper biofacies but not wide enough to induce major changes in endemicity.

PEROVSKITES AND SILICIA SATURATED SYSTEMS – TWO NATURAL ANTAGONISTS?

M. SCHOSNIG[1], E. HOFFER[1] & H.E. USDOWSKI[2]

[1] *Mineralogical, Petrological and Crystallographical Institute, University of Marburg, Hans Meerweinstraße, 35043 Marburg, FRG*

[2] *Geochemical Institute, University of Göttingen, Goldschmidtstraße, 37077 Göttingen, FRG*

Generally the crystallisation of Perovskites takes place in basaltic to alkalic, silicia undersaturated magmas. In a silica – saturated enviroment the crystallising Ti–phase is commonly Titanite. The presence of both Ti–phases is often explained. by two different crystallisation generations with changed crystallisation conditions. The examination of the phase relations and trace element distribution in the system $CaAl_2Si_2O_8$ (An) – $CaMgSi_2O_6$, (Di) – $CaTiSiO_5$ (Ti) evaluated some aspects for the Perovskite genesis in complex magmatic systems. All experiments were carried out within the composition plane of the three minerals with trace element–dopping at levels smaller than 5000 ppm. Crystallisation at nearby liquidus conditions (±5 °C) and rapid quenching allows the preparation of samples which show coexisting minerals – liquid pairs from mixtures of pseudoeutectic compositions. The surrounding system Anorthite – Titanite with and without trace elements is of special interest for Perovskite growth.

In the system Anorthite – Titanite without trace elements these two crystalline phases coexist with the liquid at 63% Ti and 37% An (1295 °C). The Anorthites are quasi stoichiometric with only small amounts of TiO_2 (0.27 Wt%). The Titanites show also a very limited solid solution (0.94 Wt% $A1_2O_3$).

1. Dopping this system with 3000ppm Nb, resp Ta. in excess causes Perovskite growth. These Perovskites coexist with Anorthites and liquid. They contain 1.4 Wt% Nb_2O_5, resp. 2.52 Wt% Ta_2O_5. Their partition coefficients are DNb = 2.37, resp. DTa = 6.46. Crystallisation experiments with Y–, La–, and Ce–dopped melts and with Sm–, Nd–, Yb–, and Lu–dopped melts exhibit also Perovskites coexisting with Anorthites and liquid. The REE concentrations vary from 0.8 Wt% La_2O_3, 2.17 Wt% Ce_2O_3, 2.45 Wt% Nd_2O_3, 3.3 Wt% Sm_2O_3, 2.62 Wt% Y_2O_3 to 0.63 Wt% Yb_2O_3 and 0.31 Wt% Lu_2O_3. Fig.1 displays this variation in terms of the measured partition coefficients.

This fact led to the conclusion, that the presence of small quantities of the trace elements in the liquid moves the stability field of the Ti–phase crystallisation from Titanite to Perovskite. The concentration range, smaller than 3000ppm, of Nb and Ta bearing Titanite – stabilisation by means of the coupled substitution 2 Ti ⇔ (Nb, Ta) + Al is still unknown. Nevertheless the trace element composition of the liquid controls the crystallisation path via mineral stability felds and therefore the final paragenesis.

2. Dopping the system Anorthite – Titanite with 1 Wt% Na_2O in excess also causes Perovskite growth. In form of a cotectic crystallisation Plagioklase, Perovskite and also Titanite are the crystalline phases coexisting with the residual liquid. The addition of 3000 ppm Nb, resp. Ta to the pseudoeutectic point of the system Anorthite – Titanite plus 1 Wt% Na_2O doesn't change this paragenesis. All 3 crystalline phases grew at the same time and are in equilibrium with the liquid as can be seen from the intergrowth fabric and from the absence of chemical zonations or inhomogenities. By the fact that the formation of an albitic Plagioklas instead of pure Anorthite deprives the liquid SiO_2, the reaction $CaTiSiO_5 \Leftrightarrow CaTiO_3 + SiO_2$ will be buffered at an equilibrium state. In this case the Perovskite growth is controled by the SiO_2 concentration in the liquid. The SiO_2 concentration in turn is controled by the formation of an albitic Plagioklase and therefore by the presence and the quantity of Na_2O in the system.

By the investigation of the model system two basic principles for Perovskite formation can be distinguished: 1. The presence of trace elements in the silica saturated system AnorthiteTitanite shifts the stability fields of Ti–phases towards Perovskite. 2. The composition of the coexisting phases (e.g. solid solution) varies the state of the coexisting melt (SiO_2 concentration) from silica undersaturated to saturated. The existence of a range of cotectic crystallisation, charaterised by the coexistence of Perovskites and Titanites, shows that the common presence of these two Ti–phases in complex natural systems doesn't imply a complex history.

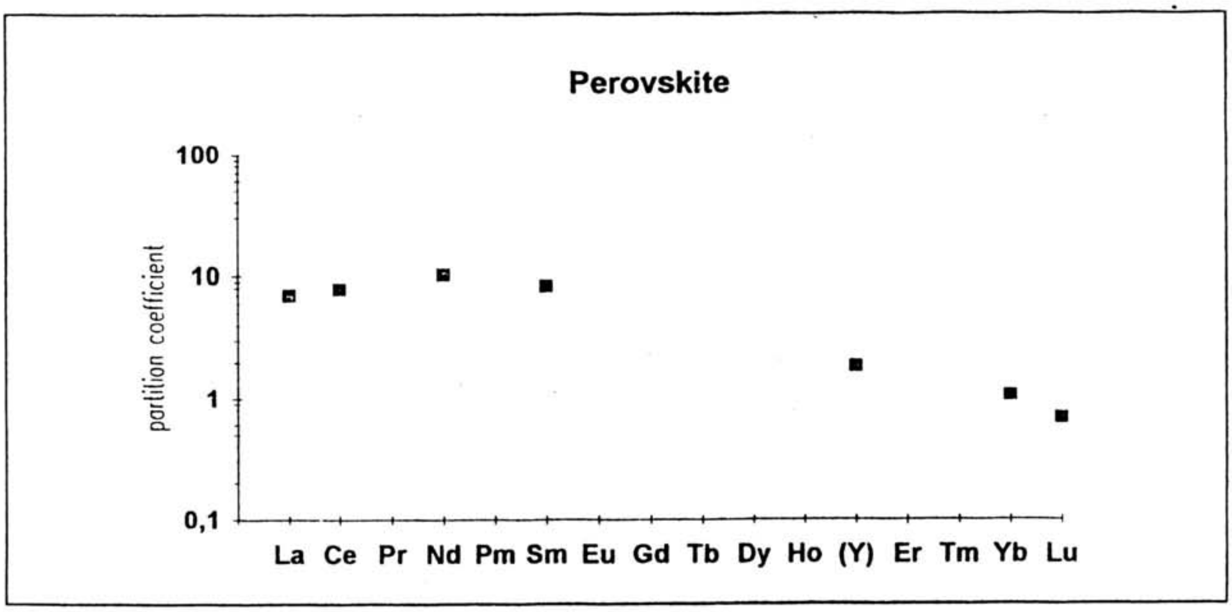

Fig. 1. REE partitioning in the system Anorthotite – Titanite