Kyanite Pseudomorphs after Andalusite from the Teplá Crystalline Complex - Evidence for Pre-Variscan Low-Pressure Metamorphism

Vladimír ŽÁČEK

Czech Geological Survey, P.O. Box 85, Klárov 3, 118 21 Praha 1

A narrow horizon of quartz-alumosilicate segregations, about 11 km long and running parallel with tectonic contact between staurolite and kyanite zone, occurs between Bezdružice and Kosí Potok Valley in the south of the Teplá Crystaline Complex (TCC). The segregation material is formed predominantly by massive kyanite pseudomorphs after andalusite and milky quartz; oligoclase (An_{8-15}), muscovite, graphite and apatite are minor components or accessories. The material was previously considered as Al-rich metapegmatite related to the Kříženec-Nezdice zone (Žáček and Cháb 1992, compare Kratochvíl et al. 1951), but new field observations have shown that it belongs to a metamorphic segregation zone, spatially not identical with the Kříženec-Nezdice metapegmatite zone (Žáček and Cháb 1998, Fig. 1). The wall rock of the zone is represented by biotite paragneiss rich in kyanite and garnet, having the assemblage: quartz + plagioclase (albite to oligoclase) + garnet + kyanite + staurolite + ilmenite ± muscovite. Quartz-kyanite segregations occur as abundant free blocks reaching the weight of up to several tens of kg. The shape of kyanite accumulations is mostly irregullar but prismatic or stubby up to 20 cm long kyanite after andalusite pseudomorphs are frequently preserved. Internal structure of crystals does not correspond to their shape; replacing kyanite forms aggregate of randomly oriented or radial laths up to 12 mm long. Rarely, relic andalusite was found as pink cores in large crystal shapes.

Remarkable similarity in geometry of the alumosilicate-rich zone with elongation of Cambrian granitic plutons (Leskov, Hanov, and Teplá plutons, Zulauf et al. 1995) and other main structures of the TCC-south suggests that alumosilicate horizon coincides with a shear zone of Cambrian age with intense hydrothermal influx of Al, Si, P, C. Metamorphic conditions of quartz-andalusite segregations formation were constrained for T = 350-550 °C, P<3.8 Kb (metamorphic event M1). During the following metamorphic event (M2), andalusite was transformed to kyanite but the shape of the original andalusite crystals remained preserved and kyanite crystallized statically as randomly oriented mineral. The character of host rock deformation and alumosilicate transformation shows that the zone was not reactivated during M2. Using garnet-biotite, garnet-staurolite and GASP geothermobarometry, the P-T conditions of 570-640 °C/ 6.5-9.5 Kb were calculated for gneiss assemblages (Fig. 1, box A = sample Z-350, immediatelly associated with quartz-alumosilicate horizon; box B = other samples in kyanite zone). The character of the Al_2SiO_5 polymorph transformation documents clearly the succession and further constrains P-T conditions of the main metamorphic events in the Teplá Crystalline Complex (see Žáček 1992, Cháb and Žáček 1997, Zulauf 1997).

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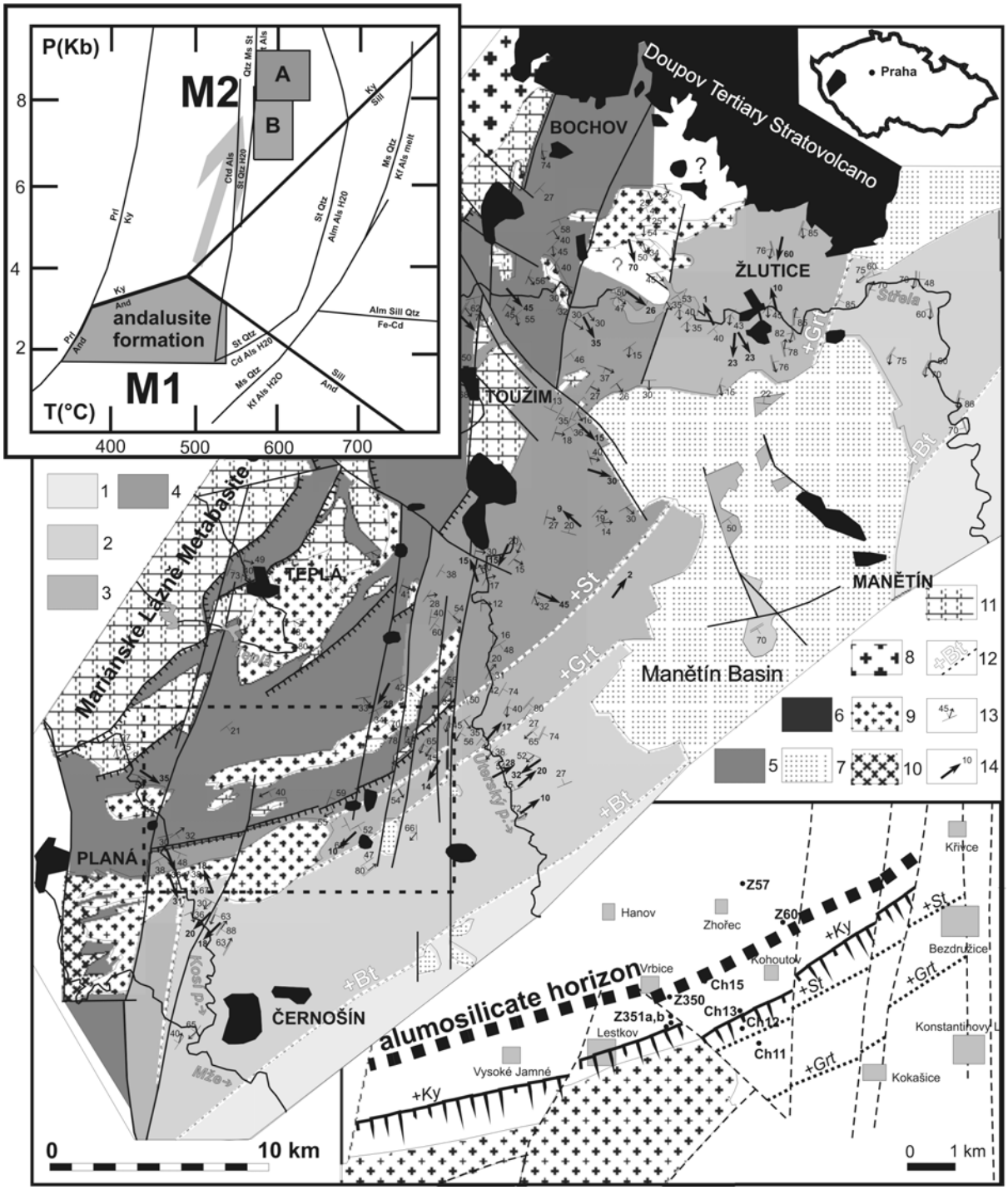

Fig. 1. Geological map of the Teplá Crystalline Complex with metamorphic zoned pattern and the location of the quartz-alumosilicate horizon in the south of the TCC. The P-T diagram shows metamorphic conditions of andalusite crystallisation (M1 - LP/MT metamorphic event), and P-T conditions of andalusite to kyanite transformation (M2 - HP(MP)/MT metamorphic event) derived from garnet-biotite and garnet-staurolite geothermometry, GASP geobarometry and from P-T grid of Spear (1993) and Yardley (1989). 1-5 Metamorphic zones: 1. Chlorite, 2. Biotite, 3. Garnet, 4. Staurolite, 5. Kyanite, 6. Tertiary volcanites, 7. Carboniferous sediments, 8. Variscan granite, 9. Metagranitoids, 10. Diorite + gabbro in the Leskov massif, 11. Metabasites, 12. Metamorphic isograde, 13. Dip of foliation, plunge of stretching lineation, 14. Fold axis.