Grain size is under 0.3 mm. Among primary minerals were identified quartz, apatite, biotite. Feldspars are not present, since they were decomposed to clay minerals and calcite. Secondary minerals are represented by hematite and more abundant pyrite. Clay minerals such as illite, chlorite and corrensite were identified by means of XRD. It is worthy to note that these intercalations are absolutely free of fossils - on the contrary to host limestones. This locality exhibits close similarities to occurrences in southern Carpathian units, rock is nearly identical with its Silicic and Turnaic equivalents.

"Pietra verde" rocks in Reifling Formation of Northern Calcareous Alps are composed predominantly of pyroclastic material. Besides that in Middle Triassic sequences of Southern Alps there also occur ignimbrites and volcanic effusives. The onset of volcanism was in Late Anisian, main phase in the Ladinian. In Central and Eastern Carnian Alps most characteristic are Late Anisian ignimbrites and submarine lava flows reworked to basal breccias. Stratigraphic frame in this case is Late Anisian – – mostly Illyrian, to lesser extent in Fassanian. Similar character show volcanogenic sequences in Transdanubian range (Bakony) and Bükkicum where besides pyroclastics also volcanic efusives are present. In Alps as well as in Bükkicum the volcanism operated in two phases:

1. Late Anisian – Early Ladinian acidic volcanism with strong explosive behaviour
2. Late Ladinian to Middle Carnian effusions of alkaline basalts (of the plateau type) in Bükk mountains, connected with extensional tectonics

Based on the type of magma it was concluded, that volcanism in Bükkicum was related to Paleotethyan subduction zone where Bükkicum and Turnaicum represent southern continental margin of Meliaticum with intensive island arc volcanism (Hovorka 1996).

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Composition and Origin of Triassic Potassium-Rich. Rhyolites of the Silicicum Superunit, Western Carpathians, Central Slovakia

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Triassic acid volcanic rocks of the Drienok and Muráň nappes formerly known as "melaphyres" and quarz porphyries (Zorkovský 1959a, 1959b, Slavkay 1965) belong to tectonically uppermost Alpine nappe structure in the Western Carpathians overlaying the Veporicum, Hronicum and Gemericum Superunits, which is known as Silicicum Superunit. Our investigated rocks were defined as potassium-rich rhyolites, enriched in K(4.9–8.7 wt.% K_2O), Si(72.8–76.7 wt % $Si0_2$), and depleted in Ti(0.08–0.30 wt % TiO_2), Mg(0.09–1.03 wt.% MgO), and especially in Ca(0.03– –1.06 wt.% CaO), Na(0.19–1.98 wt.% Na_20) and P(0.01–0.11 wt% P_20_5). Trace element geochemistry shows slight enrichment in Rb, Zr, Y and depletion in Sr, Ba, and V, as well as elevated Rb/Sr and Ga/AI ratios which are typical for alkaline-rich (A- -type) post-orogenic and anorogenic silicic magmatic suites (cf. Whalen et al. 1987).

Zircon typology (Pupin 1980) indicates a hot and dry magma environment (mainly P_4, P_5 subtypes and D types). Estimated temperature of zircon crystallization from typograms (800–900 ± 50 °C) corresponds to high zircon saturation temperature (Watson and Harrison 1983), where T = 820–845 °C. BSE shows slightly oscillatory zoning of zircon, locally with small inherited(?) oval cores. EMPA reveals Hf contents analogous to the continental crustal granite zircon: 1.0–1.7 wt% HfO_2 (cf. Pupin 1992). Contents of Y are slightly elevated: 0.4–1.0 wt. % Y_2O_3, concentrations of other elements (e.g., P, U, Th, REE) are below detection limit of the EMPA (< 0.10 wt.%). Profiles across zircon crystals do not show distinct variations between Zr, Hf and Y or systematic Hf enrichment in rims of zircon crystals.

Studied volcanic rocks close to Poniky village show specific and very similar character with the other occurrences of Triassic volcanites, especially in the Murań nappe (Veľká Stožka, Telgárt). Moreover, A-type leucogranites of the Hrončok type in the Veporic unit show also Triassic age, as resulted from U-Pb zircon dating (Putiš et al. 2000).

Rhyolites were produced in the continental carbonate platform environment of the shallow epicontinental sea, by anatexis of probably lower crustal acid material. In the Tatricum and Veporicum Superunits, the crust was thick enough to prevent the magma from reaching the surface. Consequently, volcanism occurred only in the Silicicum Superunit area with relatively thinner continental crust, in the vicinity of the Meliata-Hallstatt oceanic through.

Chemical composition of feldspars, rock major and trace elements, zircon chemistry and typology study, reveal alkaline character and crustal origin of the Silicicum rhyolites. All these data indicate the extension regime of continental rifting during post-orogenic Late Hercynian or Early-Alpine pre-orogenic stage in the Silicicum Superunit.

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Pseudotachylyte from the High Tatras: Petrology and Kinetics of Crystallisation

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Pseudotachylyte is a vein rock formed due to frictional melting associated with a seismic event. Fault-related pseudotachylytes are relatively common in thrust zones developed in basement rocks having experienced rapid uplift (the Alps, Appalachians, Caledonides, Carpathians). They form along the so-called generation surfaces accommodating the seismic slip. Pseudotachylyte was found at several places in the Vysoké Tatry (southern slope of Gerlach) and Západné Tatry Mts. The High Tatra occurrences are related to NNE striking faults with a steep dip of 75–90° both to ESE and WNW.

Three samples were studied showing different pseudotachylyte – host rock relations: (1) Pt-222, an injection vein in moderately cataclased and retrograded granite, (2) Pt-226, injected dilation fractures (Riedel shears) anastomosing from a generation surface, (3) Pt-650, curly injection veins in strongly cataclased rock (breccia). The three samples from three different places reveal similarities in mineralogical compositions on one hand, and great differences in mineral proportions and overall compositions on the other hand.

Melting relations. All samples are composed of matrix (crystallized melt) consisting of hematite (3–35%), albite and K-feldspar, and clasts dominated by feldspars and quartz. The proportions of matrix minerals are highly variable what results in melt compositional trends apparently controlled by biotite (Pt-222) or hematite (Pt-226, 650). In the sample Pt-222 K_2O contents correlate with Fe_2O_3, melt compositions lying between the source (cataclased) granite and biotite. It is therefore inferred that primary melt originated by preferential dehydration melting of biotite whose proportion in melting assemblage was 20–50 wt.% (based on biotite and pseudotachylyte melt FeO_{tot} contents). Thus, the melts have disequilibrium compositions governed by proportions of entering phases rather than by phase equilibria. Water liberated into the melt enabled further melting of quartz and feldspars. The Pt-226 and 650 samples exibit different major element trends where the Fe_2O_3 (hematite) increases are not accompanied by K_2O. It is noted that the hematite proportion increases towards tips of dilation fractures, so the most obvious way how to explain this feature seems to be hematite fractionation. This possibility is, however, not considered plausible because no reason is seen why hematite crystals should be preferentially fractionated and transported. Rather, melt differentiation (possibly by successive melting involving earlier pseudotachylyte matrix) is considered, beacuse it is the iron- and water rich melts with low viscosity which are sucked into the most distant dilation fractures.

P-T-X conditions. The presence of hematite (instead of original granitic ilmenite) indicates high oxidation conditions in the melt. Hematite is rather pure containing only 0.5–4.5 wt.% TiO_2 which gives f_{O2} values similar to those of hematite-magnetite buffer. The high oxidation is explained by complete water dissociation at high temperatures and subsequent hydrogen escape. The latter must have been very effective due to extreme surface/volume ratio of pseudotachylyte vein system. The temperature cannot be estimated directly in non-equilibrium melt. Zirconium solubility may provide an indirect estimate: the Zr concentration (170 ppm) gives the saturation temperature 755 °C. Since no zircon was found in the studied matrices (SEM images) the actual melt temperature must have been higher so that zircon could not have precipitated. Cataclasite as a related rock suggests brittle conditons in the failure zone. Pressure-temperature conditions during deformation/recrystallization have been estimated from the cataclasite assemblage biotite-chlorite-plagioclase-muscovite-epidote-hematite-quartz using THERMOCALC v.2.7 program and thermodynamic data of Holland and Powell (1998). Linearly independent reactions between coexisting mineral phases in the cataclasite yield average *P-T* conditions of 400–450 °C and 2–3 kbar. This temperature refers to a retrogressive (re-hydration) phase in the cataclasite following the seismic event.

Kinetics. Kinetic considerations are based on hematite crystal size distribution (CSD) measurements made on more than 40 BSE images and the CSD theory of Marsh (1988, 1998).