| Sounding point | Resistivity [Ωm] | Thickness [m] | Sounding point | Resistivity [Ωm] | Thickness [m] |
|---|---|---|---|---|---|
| S1 | 1350 | 1.0 | S2 | 3350 | 1.9 |
| | 24300 | 2.2 | | 4720 | 7.1 |
| | 1100 | 10.1 | | 52950 | 16.5 |
| | 350 | – | | 9160 | – |
| S3 | 3000 | 0.85 | S5 | 2800 | 1.1 |
| | 37500 | 3.85 | | 7200 | 9.2 |
| | 9050 | – | | 3000 | – |
| S4 | 8270 | 1.2 | S6 | 5340 | 2.6 |
| | 22100 | 4.6 | | 10120 | – |
| | 5000 | 1.1 | | – | – |
| | 41400 | 17.3 | | – | – |
| | 2150 | – | | – | – |

**Tab. 1.** Results of interpretation of resistivity soundings.

**Fig. 1.** Localization of resistivity soundings.

the best efficiency of the survey. Maximum current electrodes spacing was 180 m. Resixp$^{plus}$ software was supplied for geophysical interpretation. The results obtained in 1997 and 1998 are very similar. The same layer models were obtained at particular measurement points. Both thickness and resistivity are similar to each other. One obtained one 2-layer model, two 3-layer models two 4-layer models and one 5-layer model.

The depth of granitic subsoil was estimated at all resistivity measurement points. The depth varies from 2.6 m (S6) to 25.5 m (S2) (Tab. 1). The resistivity of bedrock ranges 2150 to 10,120 Ωm. One assumed that resistivity variation is a result of various water content and various fracturing.

The granitic subsoil is covered by the layer composed of stone debris, clay and gravel. The layer is more or less hydrated and compact. Atfour points we found out the high resistivity geophysical layer (resistivity exceeds tens kΩm). We assumed that high resistivity is a result of cavities existence in stone debris sediments.

The surface layer containing clay, stone debris and gravel was observed at all measurement points. The thickness of the layer is about 1–2 m.

The obtained results show that vertical resistivity soundings are an appropriate method for research of geological structure in high mountains, where for technical reasons or because of environmental protection, it is not always possible to apply traditional methods.

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# Unusual Mineral Assemblage Associated with the Fossil Fire of the Coal Seam at Želénky, North Bohemian Brown Coal Basin, Czech Republic

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Fossil pyrometamorphic processes associated with the natural combustion of Neogene coal measures in the North Bohemian Brown coal Basin produced a variety of caustically altered rocks called porcelanite, beside brick-like rocks and slags. A series of porcelanite occurrences exists in this extensive area. Many of them were exploited, the rock being used as building material or as a base coarse material for roads and railroads.

Highly unusual pyrometamorphic rocks were found in abandoned porcelanite deposit “Červený vrch” at Želénky. The locality is situated about 3 km eastward of Duchcov in the Teplice District, northern Bohemia. The deposit was intensively exploited between 1965–1988 and subsequently re-exploited in years1992–1998.

Geological structure of the Želénky porcelanite deposit is unusual. Besides Neogene sediments (clays), a part of Quaternary cover, comprising sandy gravel and loess bed, was affected by pyrometamorphism. Whole sequence (up to 25 m thick) is locally crosscut by chimney structures running from the former coal bed to the surface. Chimneys are filled with baked sandy gravel rich in glass and crystalline calcic rocks composed predominantly of melilite. These rocks may have been derived from fusion of Ca-rich loess with residual coal ash. We interpret them to have been developed by gravitational collapse of loess bed into the cavities left by the combusted coal bed. Similar mineral assemblages were described from Powder River Basin and Buffalo, both Wyoming, USA (Franklin et al. 1987; Cosca and

| mineral | melilite 1 | melilite 2 | pyroxene | $Ca_2Fe_2O_5$ | $CaFe_4O_7$ |
|---|---|---|---|---|---|
| mean | n = 22 | n = 9 | n = 18 | n = 15 | n = 4 |
| $SiO_2$ | 31,01 | 21,51 | 32,97 | 7,03 | 1,37 |
| $TiO_2$ | 0,13 | 0,16 | 2,05 | 5,58 | 0,12 |
| $Al_2O_3$ | 18,61 | 26,12 | 17,57 | 3,04 | 7,58 |
| $Fe_2O_3$ | 5,71 | 11,71 | 18,85 | 40,50 | 73,95 |
| MnO | 0,20 | 0,00 | 0,23 | 0,86 | 0,87 |
| MgO | 4,39 | 0,59 | 4,53 | 0,17 | 5,23 |
| CaO | 38,42 | 38,50 | 23,57 | 42,45 | 11,21 |
| $Na_2O$ | 0,90 | 0,34 | 0,44 | | |
| $K_2O$ | 0,19 | 0,00 | 0,07 | | |
| Total | 99,56 | 98,93 | 100,28 | 99,63 | 100,33 |
| Si | 2,886 | 2,075 | 1,284 | 0,293 | 0,079 |
| Ti | 0,009 | 0,011 | 0,060 | 0,175 | 0,005 |
| Al | 2,041 | 2,970 | 0,807 | 0,149 | 0,520 |
| $Fe^{3+}$ | 0,400 | 0,850 | 0,553 | 1,270 | 3,237 |
| Mn | 0,015 | 0,000 | 0,008 | 0,030 | 0,042 |
| Mg | 0,609 | 0,084 | 0,263 | 0,010 | 0,454 |
| Ca | 3,831 | 3,980 | 0,984 | 1,894 | 0,699 |
| Na | 0,162 | 0,063 | 0,033 | | |
| K | 0,026 | 0,000 | 0,003 | | |
| total | 9,979 | 10,033 | 3,995 | 3,821 | 5,036 |
| oxygens | 14 | 14 | 6 | 5 | 7 |

[*] Camscan – Link ISIS, Czech Geological Survey, I. Vavřín, analyst

**Tab. 1.** Average compositions of melilites, clinopyroxene and “calciferrites”*.

Peacor 1987, Cosca et al. 1989) and from the Chelyabinsk coal district in Russia (Chesnokov and Shcherbakova 1991, Kabalov et al. 1997).

The samples (collected in abandoned porcelanite quarry in 1994 by Mr. Mikoláš Mag) were examined in thin sections, by electron microprobe analysis and using XRD at Laboratories of the Czech Geological Survey in Prague. They have massive to porous, slag-like appearance and very heterogeneous mineral distribution. Two types of calcic rocks were distinguished:

1) Massive, medium-grained, dark green to yellow-green rock with abundant vugs composed of melilite, clinopyroxene and minor spinel.
2) Dark brown, medium- to fine-grained, strongly magnetic crystalline rock composed of prevailing melilite and minor larnite ($Ca_2SiO_4$); two “calciferrites”: srebrodolskite ($Ca_2Fe_2O_5$) plus unnamed $CaFe_4O_7$, besides rare barite were also identified. Late aragonite and calcite fill cavities in both rock types.

*Melilite* is pale- to honey-yellow, and forms lath shaped to sub-equant crystals up to 3 mm long. In the vugs, it forms honey-yellow pseudocubic crystals. Two compositionally different melilites occur; melilite associated with “calciferrites” is significantly richer in the gehlenite component. *Clinopyroxene* is strongly pleochroic (orange-brown – brown-green – bottle green) and forms in vugs euhedral prismatic to stubby crystals up to 3 mm long. It corresponds to diopside – esseneite solid solution with the amount of the esseneite component ($CaFe^{3+}AlSiO_6$) varying in the range of 35–72 mol.%. “Calciferrites” form irregular opaque aggregates up to 1 mm long associated with melilite and larnite. *Srebrodolskite* ($Ca_2Fe_2O_5$) forms cores and *unnamed* $CaFe_4O_7$ the rims of such aggregates. Srebrodolskite contains increased concentrations of $TiO_2$ (1–13 wt.%) and $Al_2O_3$ (1.8–4.5 wt.%); $CaFe_4O_7$ is substituted predominantly by Al and Mg (7–8 wt.% $Al_2O_3$ and 4.8–5.5 wt.% MgO).

*Spinels* occur as abundant tiny inclusions in melilite and clinopyroxene, but locally are concentrated into discrete zones. They correspond to spinel – magnesioferrite – hematite solid solution members with widely variable concentrations of Al and Mg (1.5–30.5 wt.% $Al_2O_3$, 0.0–22.0 wt.% MgO). For the mineral compositions see Table 1.

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# Syn–tectonic Emplacement of Island-Arc Calc-Alkaline Magmas during Oblique Transpression: SE Margin of the Teplá-Barrandian Zone (Bohemian Massif)

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Syn – tectonic emplacement of Variscan island-arc calc-alkaline magmas and coeval gabbros during oblique transpression was studied in the SE margin of the Teplá-Barrandian Zone (Bohemian Massif). Variscan granitoids of the Central Bohemian Plutonic Complex are exposed along the boundary of the Teplá – Barrandian Zone with Moldanubian Zone, represented in the study area by the amphibole – biotite tonalite of the Sázava type, dated at 349 ± 12 Ma (Holub et al. 1997).

The main Variscan deformation event is characterized by the development of major buckle folds, $L_1$ subhorizontal stretching