https://doi.org/10.46861/bmp.29.059 PŮVODNÍ PRÁCE/ORIGINAL PAPER

Strusky z redukční tavby pelosideritové železné rudy realizované na hradě Buchlově (jv. Chřiby) v roce 2019: extrémní variabilita fázového složení a chemismu jednotlivých fází

Slags from smelting of pelosiderite iron ore realized at the Buchlov Castle (Chřiby Mts., Czech Republic) in 2019: extreme variability of phase composition and chemistry of individual phases

Zdeněk Dolníček[1)]*, Ladislav Kandrnál[2)], Jana Ulmanová[1)], Ester Vratislavská[3)] a Pavel Hojač[4)]

[1)]Mineralogicko-petrologické oddělení, Národní muzeum, Cirkusová 1740, 193 00 Praha 9;
**e-mail: zdenek.dolnicek@nm.cz*
[2)]Kameňák 145, 696 50 Moravany u Kyjova
[3)]Vlastivědné muzeum, Palackého 70, 697 01 Kyjov
[4)]Komenského 740, 697 01 Kyjov

Dolníček Z, Kandrnál L, Ulmanová J, Vratislavská E, Hojač P (2021) Strusky z redukční tavby pelosideritové železné rudy realizované na hradě Buchlově (jv. Chřiby) v roce 2019: extrémní variabilita fázového složení a chemismu jednotlivých fází. Bull Mineral Petrolog 29(1): 59-76 ISSN 2570-7337

Abstract

During experimental smelting of iron in a replica of historical shaft furnace, which was held at the Buchlov Castle in 2019, charcoal and fresh pelosiderite iron ore from the locality Moravany near Kyjov were used. The obtained furnace slag is practically completely formed by glass phase; only rare small domains contain also crystalline phases, whose occurrence is very irregular. A detailed study of chemical composition showed extreme heterogeneity in composition of glass and most crystalline phases. The glass phase contains variable, but often high amounts of Mn, Ca, Mg and sometimes P and/or K. The composition of olivine ranges widely among fayalite, dicalciumsilicate and tephroite ($Fa_{1-91}Fo_{3-28}Te_{2-45}DCS_{1-52}$), as well as those of calcic pyroxene ($Wo_{37-60}Tsch_{1-13}Ka_{8-22}Fs_{4-30}En_{14-36}$). Feldspars showed compositions between orthoclase and anorthite ($Or_{2-82}An_{9-91}Ab_{5-19}Cn_{0-2}Slw_{0-2}$), which are unknown from natural systems. Minor components include wüstite, melilite (åkermanite with 1 - 6 mol. % gehlenite), leucite, kalsilite, locally also apatite and an unnamed phase with composition close to $Ca_2Al_2Si_3O_{11}$. The produced metallic iron is also compositionally heterogeneous and rich in phosphorus. The phase composition of slag differs significantly from those of typical iron slags. The reason can be seen in anomalous chemical composition of used ore, in too high temperatures during smelting (phase relations in metallic iron suggest temperatures around 1500 °C) in combination with rapid cooling of the furnace content after finishing of smelting, and probably also higher viscosity of slag melt. Both phase composition of slag as well as chemical composition of individual slag phases and metallic iron are significantly different from those of local historical artefacts from the period of usage of technology of direct production of iron. These findings do not support the idea that local pelosiderite iron ores were used for production of iron already during this early period.

Key words: *archaeometallurgy, experimental iron smelting, slags, phosphorus-rich iron, pelosiderite, Chřiby Mts.*

Obdrženo 18. 2. 2021; přijato 3. 5. 2021