



The Mokrsko-West gold deposit, Bohemian Massif, Czech Republic: Mineralogy, deposit setting and classification



Jiří Zachariáš^{a,*}, Petr Morávek^{b,1}, Petr Gadas^{c,2}, Jaroslava Pertoldová^{d,3}

^a Institute of Geochemistry, Mineralogy and Mineral Resources, Faculty of Science, Charles University in Prague, Prague, Czech Republic

^b Aurea, Jílové u Prahy, Czech Republic

^c Czech Geological Survey, Brno, Czech Republic

^d Czech Geological Survey, Prague, Czech Republic

ARTICLE INFO

Article history:

Received 27 June 2013

Received in revised form 10 November 2013

Accepted 12 November 2013

Available online 23 November 2013

Keywords:

Gold

Intrusion-related gold deposits

Orogenic gold deposits

Arsenopyrite

Bismuth

Tellurides

Thermometry

Metallic liquids

ABSTRACT

The Mokrsko-West deposit is unique among European Variscan gold deposits from the points of view of both the structure (an approx. 200 m thick complex of sheeted, several mm-thick, densely spaced quartz veins) and the economic viability (gold reserves of about 100 t). The deposit is hosted mainly by tonalite of the calc-alkaline Sázava tonalite suite (ca. 354 Ma) of the Central Bohemian Plutonic Complex. Mineralization is characterized by quartz-dominated gangue, no visible hydrothermal alteration, low sulfide content, high fineness native gold accompanied by maldonite, aurostibite, native bismuth and numerous Bi–Te–(S) phases. Five mineralogical stages are described in great detail. Arsenopyrite and chlorite thermometers, mineral phase stabilities and published isotope and fluid inclusion data are used to reconstruct the temperature and compositional evolution of the system. The role of liquid bismuth in the sequestration of gold is also discussed.

The deposit shares the features of both orogenic gold (ORG) and intrusion-related gold (IRG) deposits. The IRG model is advocated by close spatial association between the ore zone and the tonalite host-intrusion, by the absence/scarcity of hydrothermal alteration, by the Au–Bi–Te–As elemental association and by marked thermal gradients from the early to late mineralization stages. The ORG model is advocated by an approx. 15–10 Ma gap between the intrusion of the tonalite-host and the ore formation, by isotope and geochemical evidence for a key role of metamorphic fluids in the mobilization and transfer of many elements/species (inclusive S and Au). The apparently ambiguous classification of the deposit can most probably be attributed to deposit formation at a depth of ≥ 9 km and to setting of the deposit at/inside a large-scale plutonic complex with multiple and prolonged tectonic and intrusive activity.

© 2013 Elsevier B.V. All rights reserved.

1. Introduction

Gold mineralization is one of the prominent features of the Variscan metallogeny of Europe, and specifically of the Bohemian Massif (Morávek and Poucha, 1987, 1990; Morávek et al., 1992). Total gold resources in the Bohemian Massif can be estimated at about 400 t of gold. About two thirds of this amount is located in the central part of the Bohemian Massif, in the Central Bohemian Metallogenetic Zone (CBMZ; Morávek and Poucha, 1987), in the vicinity of the NW contact

of the Central Bohemian Plutonic Complex (CBPC; Fig. 1). Historical gold production (10th to 20th Century) from the CBMZ is estimated at about 15–20 t of gold (mainly from the Jílové deposit, significantly less from other deposits). Past production, however, accounts for only about 1/10 of the present economic gold potential of the CBMZ. State-funded prospecting and exploration during 1970–1990 focused on the gold metallogeny of the Bohemian Massif discovered about 300 t of gold resources, of which about 190 t is located within the CBMZ, largely related to the Mokrsko-West deposit (~100 t Au; Morávek, 1995b, 1996b; Morávek et al., 1989, 1990).

Most gold deposits within the CBMZ are characterized by low sulfide content, quartz-dominated gangue, lack of extensive hydrothermal alteration and dominance of early-stage aqueous-carbonic low-salinity fluids and also a change to low to moderate salinity aqueous fluids during the middle to late stages (e.g., Zachariáš and Pudilová, 2002; Zachariáš et al., 1997). The limited presence of magmatic fluids (s.s.) has been documented at the Mokrsko-West (Boiron et al., 2001) and Petráčková hora (Zachariáš et al., 2001) deposits.

Gold deposits in the CBMZ were traditionally classified as orogenic-gold deposits (e.g. Groves et al., 2003). The Mokrsko deposit, however,

* Corresponding author at: Institute of Geochemistry, Mineralogy and Mineral Resources, Faculty of Science, Charles University in Prague, Albertov 6, 128 43 Prague 2, Czech Republic. Tel.: +420 221951497; fax: +420 221951496.

E-mail addresses: jiri.zacharias@natur.cuni.cz (J. Zachariáš), moravek.aurea@seznam.cz (P. Morávek), gadas@sci.muni.cz (P. Gadas), pert@cgu.cz (J. Pertoldová).

¹ Aurea, 1, máje 296, Jílové u Prahy, Czech Republic. Tel./fax: +420 241950455.

² Institute of Geological Sciences, Faculty of Sciences, Masaryk University Brno, Kotlářská str. 2, 611 37 Brno, Czech Republic. Tel.: +420 777008620.

³ Czech Geological Survey, Klárov 3, 118 21 Prague 1, Czech Republic. Tel.: +420 257089554.

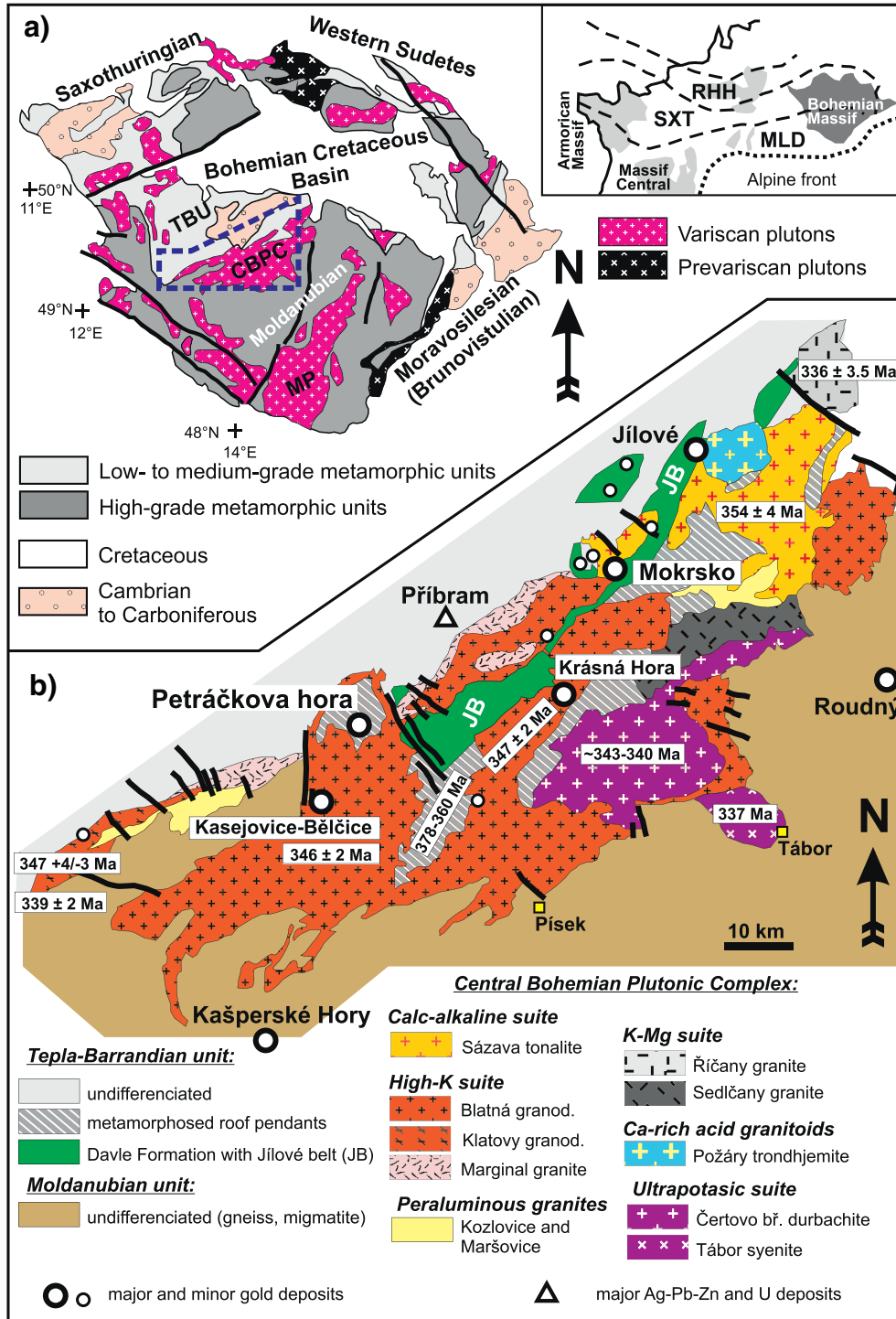


Fig. 1. Schematic geological maps (a) of the Bohemian Massif and (b) of the Central Bohemian Plutonic Complex (CBPC) and surrounding areas, including the Neoproterozoic Jílové Belt (JB) and the most important gold deposits. The small inset (a) shows the distribution of Variscan zones in Europe: Saxothuringian (SXT), Rhenohercynian (RHH) and Moldanubian (MLD). Other abbreviations used: Teplá-Barrandian Unit (TBU), Moldanubian Pluton (MP).

was reclassified as an intrusion-related gold deposit by Thompson et al. (1999) and Lang and Baker (2001). The Mokrsko-West deposit strongly resembles the Fort Knox deposit (McCoy et al., 1997), except for the presence of Au-bearing pegmatite. The Petrářkova hora deposit is another gold deposit of the intrusion-related gold affiliation within the CBMZ (Zachariáš et al., 2001). Re-Os dating of molybdenite of the Petrářkova hora (Zachariáš et al., 2001), Mokrsko and Kasejovice (Zachariáš and Stein, 2001) deposits and Ar-Ar dating of muscovite from the Jílové deposit (Zachariáš et al., 2013) documented that the

main gold-bearing event in the CBMZ occurred between 349 and 339 Ma. Gold mineralization thus significantly overlaps with the intrusive ages obtained for the CBPC (ca 355–338 Ma; see below). Coeval intrusive and mineralization ages, however, do not necessarily imply a magmatic source for the fluids (Zachariáš et al., 2013) but rather make it difficult to differentiate between orogenic gold and intrusion-related gold deposits.

This paper focuses primarily on mineralogical characterization of the Mokrsko-West deposit and on mineralogical/geochemical aspects

Download English Version:

<https://daneshyari.com/en/article/6435925>

Download Persian Version:

<https://daneshyari.com/article/6435925>

[Daneshyari.com](https://daneshyari.com)