Re–Os DATING OF GOLD DEPOSITS USING ACCESSORY MOLYBDENITE AT THE KAŠPERSKÉ HORY AND PETRÁČKOVA HORA MINES, CZECH REPUBLIC

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The Kašperské Hory deposit, worked intermittently since the 14th century, and the Petráčkova Hora deposit, discovered in 1984, reflect two geologically distinct types of gold mineralization in the mineral-rich Bohemian Massif. The Kašperské Hory deposit is located in the south-western part of the Massif composed of high-grade Moldanubian metamorphic rocks of Proterozoic and Palaeozoic age. These high-grade rocks have been dissected by a large retrograde shear zone attributed to the regional extension and uplift of the Moldanubian Block in Hercynian time. Regionally, post-kinematic Hercynian granites (300–350 Ma) are associated with this uplift and extension, but the granite outcrops closest to Kašperské Hory are ~10 km distant. Kašperské Hory gold is hosted in prominent quartz lodes and veins within this regional shear zone. In contrast, the Petráčkova Hora deposit, in the central part of the Massif, is located in close proximity to a large Hercynian plutonic complex that straddles the boundary between high-grade Moldanubian rocks to the south-east and low-grade Teplá-Barrandian rocks to the north-west. The Petráčkova Hora ores are described as "stockwork porphyry gold-type", and in distinct contrast to Kašperské Hory, they are associated with a small two-phase porphyritic granodiorite stock that intruded Cambrian volcanic–sedimentary basement.

We present Re–Os ages for Au-associated molybdenite from Kašperské Hory and Petráčkova Hora that indicate that both deposits were formed at almost precisely the same time (~345 Ma). At least one additional period of mineralization is indicated at Kašperské Hory (~310 Ma). There is geologic and geochemical evidence indicating that some earlier-formed veins at Kašperské Hory were re-opened and again mineralized. By dating Au-associated molybdenite, we suggest that regionally-infiltrating Hercynian granite magmatism, seen (Petráčkova Hora) or unseen (Kašperské Hory), was a major player in the development of Au-rich mineralization in the Bohemian Massif. The source of silica, metals, and metal-transporting fluids could have been a combination of widely circulating late metamorphic waters, derived from basement rocks, and magmatic waters, derived from Hercynian granitoids.

Sample	Run #	Re total, ppm	^{187}Os, ppb	Age, Ma
Kašperské Hory Mine				
CZ95-KH1	M-130	404 (2)	1454 (6)	342.4 ± 1.5
CZ95-KH1	M-145	549 (2)	1989 (8)	344.8 ± 1.5
CZ95-KH2	M-134	35.2 (2)	127.6 (6)	345.3 ± 1.9
CZ95-KH3	M-63	161.4 (6)	524 (6)	309.5 ± 3.4
Petráčkova Hora Mine				
CZ95-PH1	M-142	43.0 (1)	154.5 (4)	342.1 ± 1.5
CZ95-PH2	M-126	19.33 (9)	70.0 (3)	344.7 ± 1.7
CZ95-PH2	M-129	19.81 (4)	72.5 (2)	348.5 ± 1.6
CZ95-PH2	M-144	19.51 (4)	70.1 (2)	342.4 ± 1.5

Uncertainties for Re (ppm) and ^{187}Os (ppb) concentrations in parentheses; they are < 0.5 % (Re) and < 0.4 % (^{187}Os), except for the estimated 1 % uncertainty on the ^{187}Os concentration for M-63 (Os spike weighing error).

Uncertainties for ages include spike weighing errors, uncertainty in spike calibration, error magnification with under/over-spiking, instrumental uncertainty with measurement of isotopic ratios, and the 0.31 % uncertainty in the new ^{187}Re decay constant. Blank corrections are insignificant (<100 pg for Re and < 3 pg for ^{187}Os).

Re–Os age (t) calculated by $[^{187}Os]_{present} = [^{187}Re]_{present} (e^{\lambda t} - 1)$, decay constant for ^{187}Re, $\lambda = 1.666 \times 10^{-11} yr^{-1}$.

All runs were made using the Faraday cup on a 12-inch, 90° magnetic sector NBS mass spectrometer.