Gold and Platinum Group Minerals (PGM) from the Placers of Northwest Kuznetsk Alatau (NWKA) (South Siberia, Russia)

V. Gusev[1,2(✉)], S. Zhmodik[1,2], G. Nesterenko[2], and D. Belyanin[1,2]

[1] Department of Geology and Geophysics, Novosibirsk State University, Novosibirsk, Russia
vityansky@igm.nsc.ru
[2] Institute of Geology and Mineralogy SB RAS (IGM SB RAS), Novosibirsk, Russia

Abstract. Native gold and PGM from NW Kuznetsk Alatau (NWKA) (South Siberia, Russia) have been investigated. Applying the complex of advanced analytical, geo-chemical, and statistical techniques permits determination of motherlode types of noble mineralization (NM). For gold, it is mineralization of three types: 1 – the gold-sulfide-quartz type associated with dykes of the basic composition and fault-line zones (2), as well as the gold-skarn type (3). For PGM it is mineralization of the Ural-Alaskan (1) and the ophiolitic (2) types, as well as multicomponent alloys associated with layered intrusions (3). The presence of rims and inclusions is indicative of postmagmatic transformations of the minerals. In the meantime, Au and PGM from NW Kuznetsk Alatau placers retain genetic traits of motherlodes.

Keywords: Alluvial placers · Gold · Platinum Group Elements (PGE) · Altai–Sayan folded area · Kuznetsk Alatau

1 Introduction

Au placers with PGM (0.1–0.2% and more by weight of Au) are widespread on the territory of the Kelbes placer region NWKA. The placers were abandoned during last centuries, but motherlode deposits have not been discovered here. Au-quartz, Au-quartz-sulfide types, and Au-magnetite (skarn) have been discovered in NE and the central Kuznetsk Alatau region, as well as in Salair range, and PGE have been revealed in chromites and dykes of the basic composition. The contribution presents new data on the morphology, micro-inclusions, change types, and the composition of native Au and PGM from placers and their comparison with NM from motherlodes of adjacent regions in the South Siberia.

S. Glagolev (Ed.): ICAM 2019, SPEES, pp. 195–197, 2019.
https://doi.org/10.1007/978-3-030-22974-0_45

2 Methods and Approaches

Minerals were selected from heavy mineral concentrates under binocular microscope. An Axio Scope A1 (Carl Zeiss) microscope was used for determination of sizes and morphology of NM particles, and then polished preparations were made from these particles for microscopic investigations by methods of ore and electron microscopy. The composition and interrelations between minerals, micro-inclusions, and newly formed phases were studied by SEM (MIRA 3 LMU, Tescan Ltd.), and EMP methods (Camebax Micro) in the share use Center for Multielement Isotope Studies (Novosibirsk).

3 Results and Discussion

The examined gold has different morphologies (sizes, degrees of grain rounding, and deformation), it is characterized by the wide range of variations in the fineness (from 720‰ to 1000‰), by different degrees of chemical change, contains inclusions of quartz, magnetite, and clay minerals, and it is coated with material consisting of Fe hydroxides.

PGM are represented by ferroplatinum and rutheniridosmine associations, as well as by small amount of sperrylite and Pd minerals. More than 65% of grains belong to ferrous platinum and isoferroplatinum; about 30% are minerals of the Ru, Ir and Os system and about 3% are Pd minerals. The degree of grain rounding of ferroplatinum is higher than that of rutheniridosmines and sperrylite, but it is generally low which indicates a short range of their transfer. As impurities, Cu, Rh and Pd are commonly found, Au is found in rare cases.

4 Conclusions

The identified features of native Au and PGM indicate the presence of several types of motherlodes, and possibly, intermediate reservoirs, as well as various distances of placers from sources of supply. The data obtained are compatible with the assumption that input of gold from ledge ores of Au-quartz, Au-quartz-sulfide, and Au-magnetite types widespread in the eastern part of the Kuztetsk Alatau and on the Salair range, as well as from sediments of the Simonovskaya suite. The sources of PGM were rocks of the Ural-Alaskan and ophiolite complexes, fragments of which (in particular the Kaygadatsky massiv) have been established in NWKA.

Acknowledgements. This work was supported financially by the RFBR (Grant 19-05-00464) and government assignment (project No. VIII.72.2.3 (0330-2014-0016)).