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Typomorphic Features of Native Gold for Forecasting and Prospecting of Lode and Placer Gold Deposits

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Methods of native gold features' complex study developed by the authors provide their wider use in metallogenic studies: to determine types of gold mineralization, regularities of localization and preliminary evaluation prospects of areas studied. The summarized data on native gold typomorphic features as well as recommendations on their use for applied scientific targets are presented in the book "Native Gold in Lode and Placer Deposits of Russia (2003). Atlas compiled in TsNIGRI, editor in-chief A.Krivtsov.

For the first time, mathematical processing of a large dataset on gold features (granulometry, morphology, composition, fineness and paragenetic associations) allowed to identify groups of the most informative gold features for major deposit types of Russia and, based on them, create summarized graphical models of native gold clearly showing relations of specific features (size, morphological type and varieties, fineness intervals, etc.). To define a genetic type of the studied gold occurrences at the earliest gold stages (with limited data) or determine the type of a native gold source, gold study results are compared with feature models. When the studied target matches one of the known deposit types, calculated similarity coefficients can reach – 0,9.

Recently, feature models of native gold were updated by new data on gold geochemistry obtained by the use of ISP-MS method which allows to determine 70 elements from 5 mg gold mass with detectable limit of 10-3–10-5 % for various elements.

Groups of elements typical of major gold deposit types were defined. Gold from Au-polysulphide-quartz deposits carries elevated content of Bi, Cu and REE; low-sulphide Au—quartz deposits are marked by W, Sn, Sr and Ba. Gold from deposits of Au-Ag style is rich in Se, Te, Sb and Rb.

Geochemical features of gold from various deposit types are important criteria to solve issues related ore matter sources. Zonality and stages of mineralization are reflected in regular change of gold-bearing associations and chemical composition of gold.

In a hypergenesis zone (oxide ores and crusts of weathering), secondary gold, its parageneses and structure can be used to determine the role of secondary ore enrichment and clarify the data of primary mineralization composition. Relative distance of gold transfer in placers is indicated by the degree of primary form transformation (roundness, flatness), intensity of subsequent compositional deformation (translation, recrystallization), depth of corrosion.

Saturation and dispersion areas are defined by the intensity of exogene gold transformation in placers. Sudden emergence of poorly altered gold in a placer suggests additional supply sources. Time of gold transfer into a placer from primary sources (pre-Pliocene, Miocene – Lower Pleistocene and later) is determined by intensity and succession of gold structure exogene transformation.

Quantitative relations of non-coeval gold along placer strike indicate localization areas of primary and intermediate supply sources.

Changes in native gold typomorphic features, from generation in ores to formation of secondary concentrations with fully recrystallized gold, reflect the evolution of geological processes in gold deposit formation.