

Isotope fingerprinting of placer gold from Kurnalpi Terrain, Yilgarn Craton, Western Australia

SVETLANA G TESSALINA¹, ELENA ANATOLYEVNA HANCOCK², DR. BRYANT WARE, PHD³ AND NEAL J. MCNAUGHTON⁴

¹John de Laeter Centre, Curtin University

²Geological Survey of Western Australia

³John de Laeter Centre

⁴Curtin University

Presenting Author: svetlana.tessalina@curtin.edu.au

Placer gold nuggets for this study have been sourced from gravels beneath the surface, distributed over an area of 80 km² within the Archean Kurnalpi Terrain in the Eastern Goldfields Superterrane. The microstructure of selected nuggets indicate various degrees of alteration and recrystallization, from monocrystalline to mostly recrystallized. Some nuggets contain inclusions of galena, maghemite, and AuAg tellurides. Local host rocks are represented by metamorphosed basalt of 2.96-2.65 Ga.

Six gold nuggets as well as galena inclusions were analysed for Pb-Os isotopes, PGEs and other trace elements. Galena inclusions display the most primitive Pb isotope ratios corresponding to the Archean model age of 2.66 Ga; gold itself displays slightly more radiogenic Pb isotopic compositions with model ages ranging from 2.62 up to 2.44 Ga, for the least altered samples (Fig.). The source μ (²³⁸U/²⁰⁴Pb) values for these less radiogenic samples range from 8.17 to 8.28, similar to values of volcanogenic massive sulphide deposits Teutonic Bore and Nimbus (8.1 and 8.4 correspondingly). These results indicate a mostly juvenile, predominantly mantle-derived source. The primitive Os isotope composition of the less altered gold nuggets concurs with the Pb results. The most altered and recrystallised samples display more radiogenic Pb values up to ²⁰⁶Pb/²⁰⁴Pb=17.81, which could reflect Pb mobility during later burial.

Although nuggetty gold mineralisation is unknown in the local sub-economic orogenic gold deposits, our study suggests that gold nuggets formed in Archean time and accumulated either by prolonged lateritic erosion of several local primary sources, and/or by exposure of different vertical levels of mineralization.

Fig. ²⁰⁶Pb/²⁰⁴Pb versus ²⁰⁷Pb/²⁰⁴Pb plot for galena and native gold from Kurnalpi terrain in comparison with stratiform VHMS deposits (Nimbus [1] and Teutonic Bore [2]) as well as epigenetic gold mineralisation from Norseman-Wiluna terrain [3]. Note that deposits are distributed along the line depicting similar age but different μ values, reflecting mixture between more juvenile (e.g., Teutonic Bore) and more “crustal” sources.

References

1. Barrote al. (2020), *Prec Res* 337, 105536
2. Barrote et al. (2020), *Ore Geol Rev* 120, 103448
3. McNaughton et al. (1990), In: Ho et al. (Ed), *UWA*

