Mineral chemistry and Os isotope systematics of Os-bearing alloys from the Guli massif (Russia): New data

I.YU. BADANINA[1,2], K.N. MALITCH[2] AND I.N. KAPITONOV[2]

[1]NATI Research JSC, St. Petersburg, Russia (guli@online.ru)
[2]All-Russia Geological Research Institute, St. Petersburg, Russia (Kreshimir_Malich@vsegei.ru)

The Guli clinopyroxenite-dunite massif, like other clinopyroxenite-dunite massifs, e.g. Kondyor and Inagli, is situated at the periphery of the Siberian Craton (Russia). The unique features of the Au-PGE placers at Guli are (1) the dominance of Os-rich alloys over other platinum-group minerals (PGMs) and Au, and (2) the considerable predicted resources of noble metals, particularly osmium (*Malitch et al*., 2002). This report presents for the first time results on mineral chemistry and Os isotope compositions of bedrock and detrital Os-rich alloy grains derived from three localities within southern part of the Guli massif. The Os isotope composition of PGMs was determined by laser ablation (LA) attached to multiple collector inductively coupled plasma mass spectrometry (MC-ICP-MS) at All-Russia Geological Research Institute.

The PGM assemblage in chromitite is dominated by iridian osmium (5-100 microns in size); subordinate PGMs are laurite, osmian iridium, tetraferroplatinum, an unnamed RhNiAs and Ni-Ir sulphide. The majority of Os-rich nuggets from placer deposits (i.e. Ingaringda and Burlakovsky), both single crystals and crystal aggregates, subdivided into six morphological types, are dominated by Os-rich alloys with considerable inter-nugget variation of Ir and Ru. Os-rich alloy nuggets are controlled by their chemical composition (type 1, 2, 5 and 6 correspond to osmium, with Os content > 80 at. %; type 3 and 4 are iridian osmium) and partly by the Os isotope composition. At Ingaringda, average $^{187}Os/^{188}Os$ value for Os-rich alloys vary from 0.12443 ± 0.00010 (type 6) to 0.12475 ± 0.00053 (type 3), whereas at Burlakovsky those are less pronounced. The Os isotope composition of type 3 and 4 nuggets slightly differs from that of other types. This variability supported by mineralogical evidence can be attributed to different source rocks (chromitite vs dunite).

The $^{187}Os/^{188}Os$ values of the Os-rich alloys studied are close to those from a former N-TIMS study (*Malitch*, 2004), which showed mean value of 0.12463 ± 0.00034. The similar range of $^{187}Os/^{188}Os$ values for Os-rich alloys, exemplified by both LA MC-ICP-MS and N-TIMS, is consistent with that for PGMs from Kondyor, and likely indicates a highly productive single-stage formation of PGMs in clinopyroxenite-dunite complexes. Finally, $^{187}Os/^{188}Os$ model ages of osmium and iridian osmium constrain the age of ultramafic protoliths indicating that this event took place in Late Proterozoic, which corresponds to a stage of active tectonism in the development of the Siberian Craton.

Geo-electric investigation of Igbonla Geothermal Sources, South Western Nigeria

B.S. BADMUS[1], E.A.A YOLABI[2] AND A.A. ADEBOWALE[2]

[1]Department of Physics, University of Agriculture, Abeokuta, Nigeria.
[2]Department of Physics, University of Lagos, Akoka, Lagos, Nigeria

Abstract

Twelve Schlumberger Vertical electrical Soundings were carried out Igbonla geothermal source, Epe, South Western Nigeria to investigate the geothermal source located within this area using current electrode separation (AB) of 1,500.0m. The interpreted result revealed a maximum of seven geo-electric layers composing of topsoil, sandy clay, clayey sand, clay, limestone and sand. The geothermal source was penetrated beneath three VES point at depth between 160 to 418m.

Introduction

Geothermal energy is produced from the heat of earth's interior. Volcanoes, geysers, hot springs and boiling mud spot are visible evidence of great reservoir of heat that are located within and beneath the earth's natural heat associated with active volcanoes or geologically young inactive volcanoes still giving off heat at depth. It has its origin in the molten core of the earth, where temperatures are 400^{o}C. The geothermal field has been the subject of numerous geologic, geophysical and geo-chemical investigations by both the geothermal industries and various governmental organisations, therefore advances in this field will improve commercial development for economic reliability and commercial safety.

Several boreholes have been drilled in the past within the southwestern Nigeria, where this study was carried; and hot water has been located within the aquifer at a depth ranging from 600.0m with temperature ranging between 29^{o}C to over 72^{o}C where several attributes make geothermal energy a good source of energy. It can be exploited without burning fossil fuel (coal, gas or oil) and it produces only one-sixth of the carbon dioxide that a natural gas fuelled power plant or sulphur-bearing gases

Conclusion

The geo-electric investigation carried out at Igbonla Epe South western Nigeria revealed the hot water reservoir to be characterized by low resistivity sand bed with resistivity varying from 6.5 to 30.0Ωm at depth of 160 to 418m. The boundaries of the geothermal field as obtained by the qualitative interpretation of the VES curves gave a reasonable result as inferred from the lithological data at Igbonla. On a general note, Abeokuta formation show geothermal activity from Igbonla eastwards to Ikeja and has derived its heat from the earth's interior.