

Metals in 'extreme' oils

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There are carried out analysis of 'extreme' oil set - oils from reservoirs in crystalline basement (White Tiger and etc.) and from Baikal lake and Black sea seeps, oils from oldest Proterozoik to 'young' Q reservoirs, oils from coal mine and oils from shale oil. All oils have outstanding peculiarity in biomarkers distribution. Oil samples have been analyzed to identify the presence of microelements using the substance composition analyzer - Energy dispersive X-Ray fluorescence spectrometer «ReSPEKT». The limit of detection for elements with nuclear number that is bigger than 17 is 0.5 ppm.

By the received results some conclusions have been made.

1. Vanadium and nickel had mainly negative correlation with other found out microelements –it can be explained by different genetic sources. V and Ni – may have organic source and other – inorganic. 2. V/Ni ratio exactly is reflected to type of source organic matter. 3. Among themselves ore elements, such as Cu, Zn, Fe, Pb, Mn correlate well 4. Very high positive correlation between the lead and arsenic content are found out. 5. The titanium has strongly pronounced correlation with ore elements. 6. It is not revealed any dependence of elements quantity on depth and age of the oil samples. 7. We see good correlation between high content of some elements in oils, such as Pb, As Ti, and nearness to basement rocks (Fig. 1), at that just basalt rocks. 8. Oils direct from granite reservoirs have not characteristic property in elements distribution. 9. In some oils from strange group – Pz oil and Black sea seep there are very high concentration of strontium. 10. Ore elements could be extracted by oils from mineral matrix or solved in oils from hydrothermal fluids

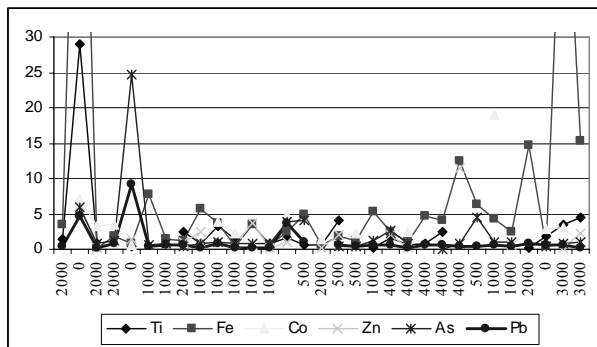


Figure 1: Elements in oils ranged by nearness to basement.

The origin of Palaeoarchaeon silicification inferred from coupled Si-O isotopes

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Silica alteration zones, a conspicuous feature of Palaeoarchaeon greenstone belts [1], demonstrate the ubiquity of extreme silica mobilisation in the early Earth's environment. To shed light on their origin, we investigated Si and O isotopic composition of two successions of variably silicified basalts and overlying bedded cherts from the Kromberg (K3c, 3.33 Ga) and Theespruit (3.54 Ga) formations of the Onverwacht Group in the Barberton Greenstone Belt, South Africa.

The Kromberg Formation shows similar Si-O-isotope fractionation trends as a previously investigated section from the Hooggenoeg Formation (H5c, 3.45 Ga) [2]. $\delta^{30}\text{Si}$ increases by 1.1‰ as the degree of silicification increases from fresh basalt (-0.25‰) to the most silicified basalts (+0.81‰) with correlated changes in the $\delta^{18}\text{O}$ value (from +10.0‰ to +15.6‰, respectively). The correlation between Si and O isotope composition observed in both Hooggenoeg and Kromberg basalts agree well with the calculated difference in Si-O isotopic fractionation factors [3] for low temperature (<380°C) hydrothermal isotopic equilibria between quartz and kaolinite.

The older, more strongly metamorphosed basalts from the Theespruit Formation show similar changes for Si isotopes (-0.24‰ to +0.46‰), but a much more restricted range of O isotope composition ($\delta^{18}\text{O} = +8.9‰$ to +11.9‰). This Si-O decoupling suggests that Si isotopes are more resistant to metamorphic resetting than O isotopes.

[1] Hofmann & Harris (2008) *Chem. Geol.* **257**, 221-239.

[2] Abraham *et al.* (2007) *Geochim. Comochim. Acta* **71**, A3.

[3] Méheut *et al.* (2009) *Chem. Geol.* **258**, 28-37.