Estimation of mass discrimination in MC-ICP-MS Nd isotope analysis using generalized power law

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The multi collector Inductively Coupled Plasma Mass Spectrometer (MC-ICP-MS) is known for large mass discrimination when compared to Thermal Ionization Mass Spectrometer (TIMS), but remains time-independent. An exponential law is routinely used to correct for this mass discrimination in MC-ICP-MS analysis. Although, this resulted in precisions of < 50 ppm when compared to TIMS analysis, the fringe isotope ratios, eg. $^{150}Nd/^{144}Nd$ seems to deviate by > 500 ppm. Thus, a generalized power law (GPL; [1]) was introduced. Applying GPL for Nd isotope analysis of JMC Nd, it was shown that an exponent variable (n) of -0.23 is more effective in correcting the measured Nd isotope ratios using Nu Plasma MC-ICP-MS [2]. Also it was observed that variable n for various instruments generally ranges between -0.2 and -0.5. In this work, we estimated the n value for Nd isotope compositions of JNd_i measured on Nu HR MC-ICP-MS and found that GPL with a n value of -0.19 is more effective (Fig. 1). This value of n appears similar to the one obtained by Wombacher and Rehkamper [2].

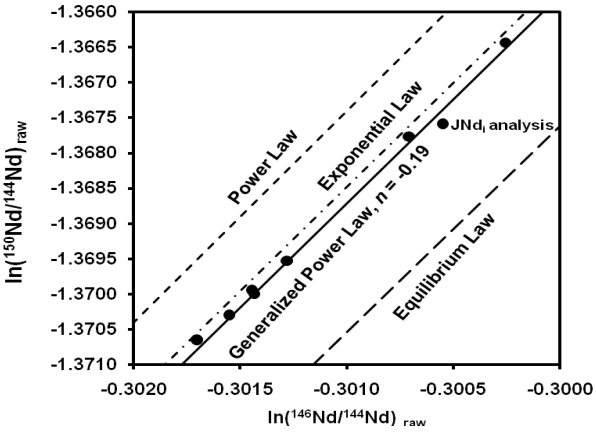

Figure 1: Analysis of JNd_i with various laws for correction

[1] Maréchal, C.N. Télouk, M & Alberède, F. (1999) *Chem. Geol.* **156**, 251–253. [2] Wombacher, F & Rehkämper, M. (2003) JAAS, **18**, 1371–1375.

REE distribution for the Arkachan large intrusion-related Gold deposit: Evidence for fluid origin

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The Arkachan gold deposit is located in the tin metallogenic zone of Mesozoic Verkhoyansk belt (400 km to the North of Yakutsk) and hosted by sandstones and siltstones $C_{2\text{-}3}$-P_1. There is granite intrusion 2 km beneath the deposit. REE were determined by ICP-MS for unaltered and altered host rock, for quartz and carbonate and for fluid inclusions.

The REE total content increases from unaltered to altered host rocks from 90 to 200 ppm and from 170 to 830 ppm for sandstones and siltstones, respectively. All studied host rocks, ore carbonate and quartz are enriched in LREE, but carbonates from altered terrigenous rocks has La/Yb<1. Host rock alteration produced by acidic high temperature fluids and REE distribution were controlled by the sorption. Role of the complexation is increased at ore quartz and carbonate precipitation. Values of tetrad effect, more pronounced for the third tetrad are 1.2-1.5. Distinct negative Eu anomaly (Eu/Eu*=0.4-0.7) prevails in the rocks and minerals (Fig.1).

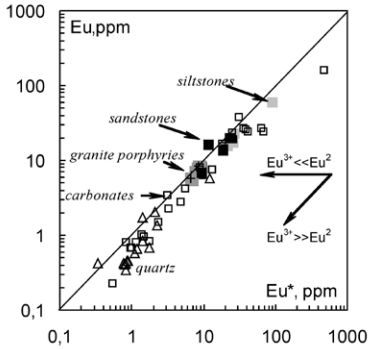

Figure 1: Plot of chondrite-normalized Eu concentrations versus calculated Eu^*_n values, where $Eu^*_n=(Sm_n(Tb_n \cdot Eu_n)^{½})^{½}$.

Fluids with deficient of Eu derived from granitic plutons. The Eu/Eu* values for the some samples, e.g. for late quartz, are 1-1.4, specified by a relatively reduced hydrothermal fluid with $Eu^{3+}<<Eu^{2+}$. The inverse relationship of ∑REE and of Eu/Eu* indicates a substantial role of magmatic fluid in the formation of the altered rocks. The hydrothermal fluids of the Arkachan deposis are known to be a mixture of H_2O+CO_2+NaCl with salinity of 3.7 to 26.3 wt % NaCl-equv. leaving chloride as the most likely candidate for the REE-transporting agent. LREE depletion of the siderite might be a result of the mineralogical control.