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Pb-Sr-Nd ISOTOPIC CHARACTERIZATION OF USGS REFERENCE MATERIALS BY TIMS AT CPGeo-USP

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1. Introduction

Systematic analyses of Pb, Nd and Sr isotopic compositions of USGS Reference Materials (BCR-1 and AGV-1) were carried out at the Geochronological Research Center (CPGeo- USP).

2. Analytical procedures

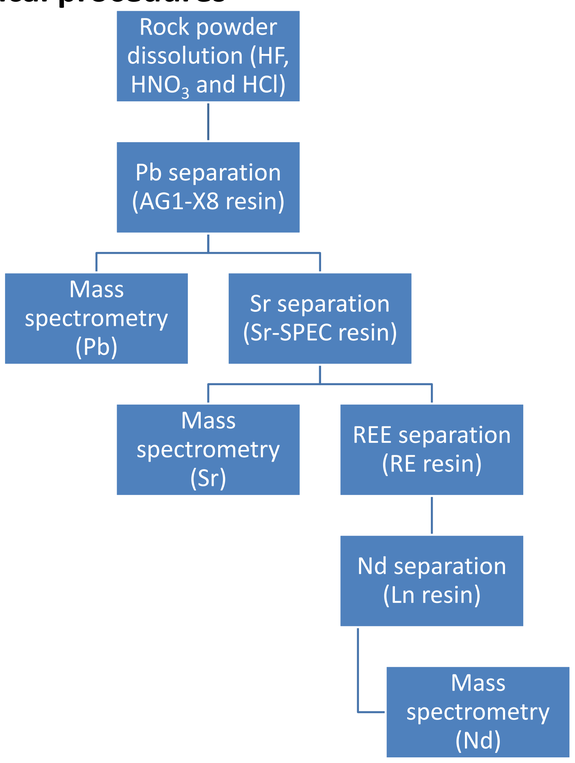

Figure 1 – Analytical procedure scheme for Pb, Sr and Nd isotope analyses.

3. Mass spectrometry

The measurements were performed either on a Thermo Triton or on Finnigan MAT 262 Thermal Ionization Mass Spectrometers (TIMS) (**Figure 2**). The mass spectrometry parameters used are listed in **Table 1**.

Figure 2 – Mass spectrometers at CPGeo: A- Finnigan MAT 262; B- Thermo Triton

Table 1- Mass spectrometry parameters for Pb, Sr and Nd analyses

Element	Degassed Filament	Load	Temperature of Analysis (°C)	Ion Bean Intensity(V)	Normalization - Correction
Sr	Single Ta	0.1M H_3PO_4	1300 - 1500	^{88}Sr-Higher than 1	$^{86}Sr/^{88}Sr$=0.1194 $^{85}Rb/^{87}Rb$=2.59265 (IEC*)
Nd	Double Re	H_2O	1630	^{145}Nd-Higher than 1	$^{146}Nd/^{144}Nd$=0.7219
Pb	Single Re	0.1M H_3PO_4 and Silica gel	1200 - 1300	^{208}Pb -Higher than 2	External normalization**

* IEC – Interference Element Correction

** Instrumental mass fractionation factor of 0.11 %/amu was applied for external normalization of Pb measurements. This factor was calculated based on the average measurements of NIST SRM 981 ratios compared to the values proposed by Todt [1].

4. Results

Pb, Sr and Nd isotope standards data from the last 12 months are presented in Figures 3, 4, and 5. The isotopic compositions of USGS reference materials (BCR-1 and AGV-1) obtained during this study and the certified values are presented in Table 2.

4.1. Pb, Sr and Nd isotope standards

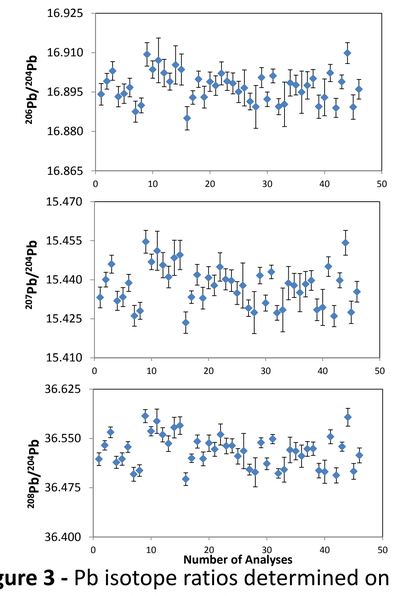

Figure 3 - Pb isotope ratios determined on SRM 981 Pb standard during this study.

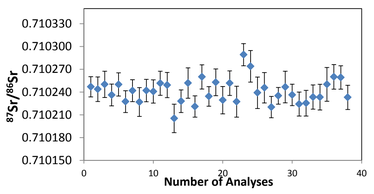

Figure 4 - Sr isotope ratios determined on SRM 987 standard during this study.

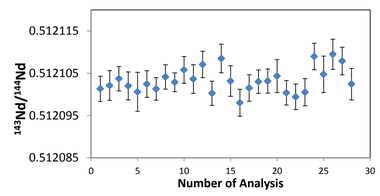

Figure 5 - Nd isotope ratios determined on JNdi -1 standard during this study

4.2. Reference Material

Table 2 – Data obtained for reference material (AGV-1 and BCR-1) during this study.

Isotope Ratios	This Study		Reference values
	AGV-1		
$^{87}Sr/^{86}Sr$	0.703981 ± 0.000047	n=15	0.703996 ± 0.000020[5]
$^{143}Nd/^{144}Nd$	0.512782 ± 0.000010	n=15	0.512784 ± 0.000018[5]
$^{206}Pb/^{204}Pb$	18.931 ± 0.013	n=10	18.938 ± 0.003[6]
$^{207}Pb/^{204}Pb$	15.647 ± 0.019	n=10	15.650 ± 0.004[6]
$^{208}Pb/^{204}Pb$	38.541 ± 0.062	n=10	38.554 ± 0.019[6]
	BCR-1		
$^{87}Sr/^{86}Sr$	0.705026 ± 0.000037	n=7	0.705025 ± 0.000019[5]
$^{143}Nd/^{144}Nd$	0.512628 ± 0.000005	n=15	0.512629 ± 0.000014[5]
$^{206}Pb/^{204}Pb$	18.791 ± 0.021	n=10	18.817 ± 0.005[6]
$^{207}Pb/^{204}Pb$	15.627 ± 0.007	n=10	15.631 ± 0.004[6]
$^{208}Pb/^{204}Pb$	38.689 ± 0.023	n=10	38.720 ± 0.014[6]

5. Conclusions

The Pb, Nd, and Sr isotopic ratios obtained at CPGeo agree with the certified values of the AGV-1 and BCR-1 USGS reference materials within the error. However, Pb average isotopic composition for AGV-1 and BCR-1 show precision (2SD) between 318 and 1617 ppm. These data confirm heterogeneous lead isotope compositions in the first generation of the Reference Materials [5,7,8].

6. References

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