5.0.P03

The importance of grain-size in geochronology: Examples from Spain and Mexico

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Modern geochronology points towards small samples and in-situ analyses. This tendency, although a very good choice, cannot discredit the old approach of measuring several grains together, as will be shown. It must be take into account that a single kilogram of rock contains no less than 10,000 standard thin sections, so the multigrain approach can give a detailed age population not necessarily discernible in a particular thin section.

A detailed grain–size separation of micas (muscovite and biotite) of several intrusive rocks from the Sierra Madre del Sur (Mexico) and the Pyrenees (Spain) and posterior dating by K/Ar method using laser fusion show typically an age – grain-size correlation. In three cases, the dating of large grain sizes gives exactly the exact U-Pb age of the samples, contrary to previous reports on the same rocks using a less detailed sampling. As reported by other authors in the past, but never fully explored, large micas can almost give crystallization ages in a number of cases, even if the rocks have cooled at moderate rates.

In the eastern Pyrenees the age difference between very large and small grain sizes of fully coeval Late Hercynian (~285 Ma) muscovites can be extraordinary (more than 70%), so dating of mica without a grain-size study can be meaningless. The latter has been done for decades in the Pyrenees, giving a geochronological scenario very difficult to understand. In fact, in the studied case, the true age cannot be obtained at all with the typical grain size used in routine dating (< 1mm in diameter).

In the Sierra Madre del Sur, biotite ages of adequate grain-size gives the U-Pb age (~35 Ma), which has not previously been accomplished by K/Ar or Rb/Sr dating, indicating of the power of the grain-size dating approach.

In conclusion, detailed sampling and dating of diverse grain-sizes (if available) from a single sample can provide sections of the thermal history of the rock unit using only one dating technique. These data must be, of course, complemented by other dating methods for composing a complete geological scenario.

5.0.P04

Pb-Isotope ratio analysis in geological samples by Q-ICP-MS and comparison with TIMS

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Determination of Pb isotope ratios by Thermal Ionization Mass Spectrometer (TIMS) involves tedious column chemistry and long machine time. An attempt is made to estimate Pb-isotope ratios in geological samples by Quadrupole Inductively Coupled Plasma Mass Spectrometer (Q-ICP-MS) in a solution containing 0.02% total dissolved solids (TDS) [1] For precise and accurate isotope ratio estimations, a blank and Pb reference material NIST SRM 981 was measured as reference standard to calculate ratio correction factor (RCF) for subsequent mass discrimination corrections. Interference by ^{204}Hg on ^{204}Pb was corrected using Elan 2.4 version software.

The effectiveness of this method is evaluated by estimating Pb-isotope ratios in USGS international rock reference samples Andesite (AGV-1), Basalt (BHVO-1)) and compared with published data [2], which are in good agreement (Table-I). The precision obtained for isotope ratio determinations of **$Pb^{206/204}$, $Pb^{207/204}$, $Pb^{208/204}$** are better than 0.5% RSD. Carbonatite and pyroxenite samples were also analyzed by Q-ICP-MS and compared with the data obtained by TIMS. Details of the dissolution procedure, instrumental parameters together with results will be presented. The results obtained in this investigation reveal that this analytical method is suitable for rapid and initial screening of Pb isotope ratios in large number of geological samples.

Table-I. Pb Isotope data for USGS BHVO-1 & AGV-1

Sample		$Pb^{206/204}$	$Pb^{207/204}$	$Pb^{208/204}$
BHVO-1	Q-ICP-MS*	18.849	15.732	38.730
	Published values[2]	18.689	15.568	38.337
AGV-1	Q-ICP-MS*	18.890	15.675	38.597
	Published values[2]	18.945	15.659	38.560

* Average of six estimations

References

[1] Balaram, V and Gnaneshwar Rao, T (2003), *Atomic Spectroscopy* **24**, 6, 206-212.

[2] Woodhead, J, D. and Hergt, J, M (2000), *Geostandards News Lett*. **24**, 1, 33-38.