ALS Method PbIS-RAT61™

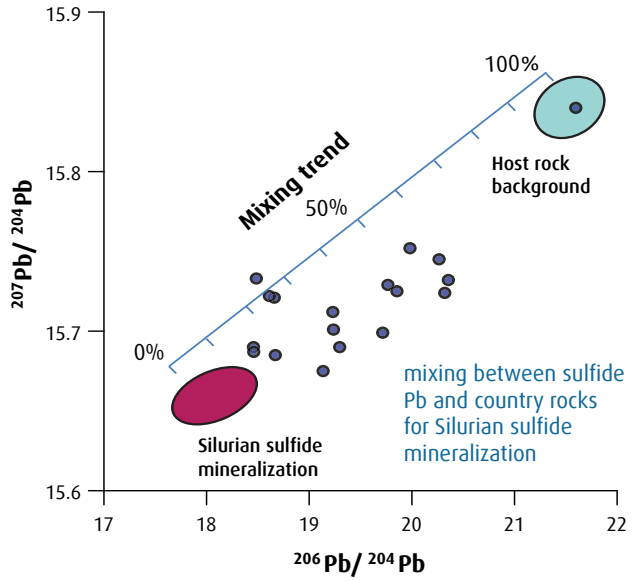
Pb Isotope Ratios

Rapid, low cost, fit for purpose Pb isotope analysis for finger printing Pb sources in mineral exploration.

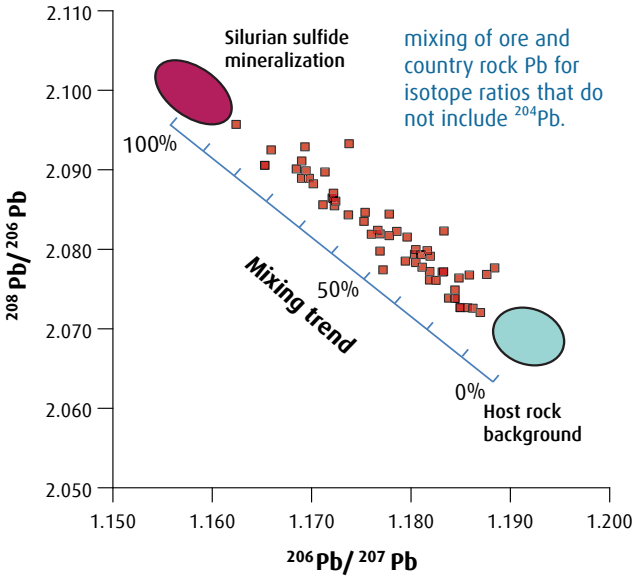
The utility of determining Pb isotope ratios is well understood in the geosciences for purposes including dating of rocks and minerals, differentiating magma sources and igneous processes, and more rarely, as a vectoring tool in mineral exploration. Traditionally, Pb isotopes have been determined by thermal ionization mass spectrometry (TIMS) or by magnetic sector inductively coupled plasma mass spectrometry (MS-ICP-MS). However, widespread use of Pb isotopes in the mineral exploration industry has been hampered by the high cost of these analyses.

The power of Pb isotopes comes from the different U/Pb and Th/Pb values of different minerals; these values change with time owing to the radiogenic decay of ^{238}U to ^{206}Pb, ^{235}U to ^{207}Pb and ^{232}Th to ^{208}Pb. ^{204}Pb is the stable isotope of Pb and does not change with time. The major reason that Pb is such a powerful tool in mineral exploration is the fact that Pb isotope ratios are not changed by modern surface processes such as weathering, soil formation and glaciation. The two main variables that result in change in Pb isotope ratios is time and mixing of Pb from different sources.

Challenges to successful Pb isotope determination include ^{204}Pb mass overlap with ^{204}Hg. Traditionally, this mass overlap has been overcome through time-consuming column separations to isolate Pb. The method at ALS circumvents this separation step through unique sample preparation and introduction approaches. For mineral exploration purposes, the level of precision required is lower than is required for age dating; we use careful tuning of the ICP-MS instrument to rapidly scan the isotopes of interest and provide a level of precision that is fit for purpose for mineral exploration.

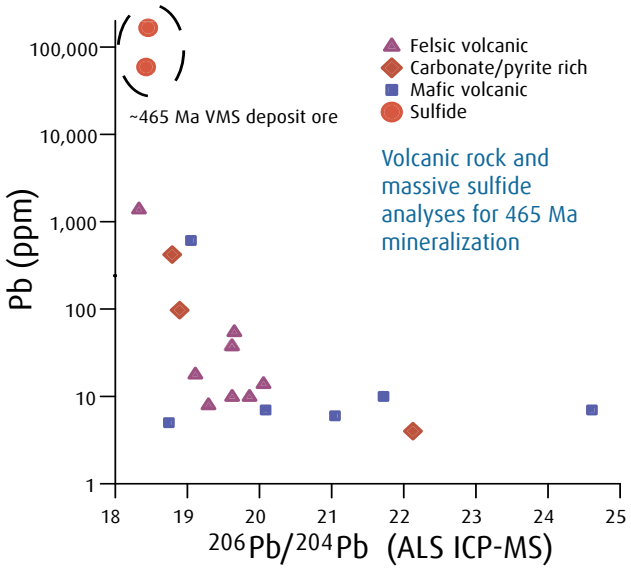


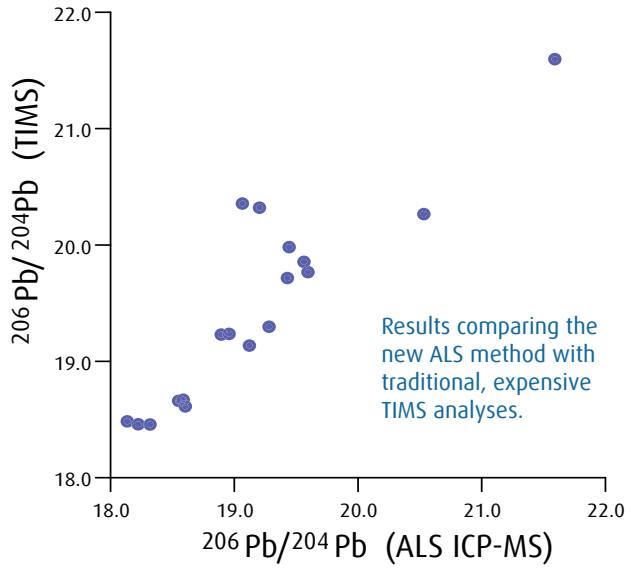
As a vectoring tool, Pb isotopes are useful for two kinds of mineral deposit; sulfide-rich and U-rich. For sulfide deposits, the Pb isotope ratio of the ore does not change with time, as U and Th are excluded from sulfide minerals - in this case, host rocks become more radiogenic (higher Pb isotope ratios) with time, and therefore increasingly different from the sulfide ore. For U mineralization, the opposite is true - the ore becomes more radiogenic than the host rocks with time because of the elevated U and Th in the ore.



An analytical method that provides our clients with six isotope ratios for use in mineral exploration: $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, $^{208}Pb/^{207}Pb$, $^{208}Pb/^{206}Pb$, and $^{206}Pb/^{207}Pb$. Precision and accuracy are monitored using certified Pb isotope and internal rock standards. We offer the Pb isotope method (PbIS-RAT61™) as an add-on to our trace level four acid digestion method (ME-MS61™), or as a stand-alone method where Pb contents are known. This method is best suited to soil and surface sediment geochemical exploration programs, stream sediment surveys, and drill core.

*Note: Samples must contain > 2 ppm Pb for analysis to be viable.





ALS provides a wide range of specialised testing services covering all stages of your project's life cycle.

Please visit **alsglobal.com** for more information on our services and specialties.

Right Solutions · Right Partner

alsglobal.com

GEOCHEMISTRY CLIENT SERVICES

Australia/Asia — Brisbane
T +61 7 3243 7222
E CSGBR@alsglobal.com

Australia/Asia — Perth
T +61 8 9347 3222
E CSGPH@alsglobal.com

Africa — Johannesburg
T +27 11 608 0555
E ClientServicesAfrica@alsglobal.com

Brazil — Belo Horizonte
T +55 31 3045 8400
E ALSBH.ClientServMin@alsglobal.com

Canada — Vancouver
T +1 604 984 0221
E ClientServicesWCAN@alsglobal.com

Chile — Santiago
T +56 2 2654 6100
E Santiago.MineralServices@alsglobal.com

Europe — Loughrea
T +353 91 841 741
E ALSM.Loughrea@alsglobal.com

Europe — Seville
T +349 55 981 491
E alssv@alsglobal.com

Mexico — Hermosillo
T +52 662 260 7586
E ClientServicesMEX@alsglobal.com

Peru — Lima
T +51 1 574 57 00
E ServicioAlClientePeru@ALSGlobal.com

Ecuador-Quito
T: +593 2 513 0891
E: ALSEcuadorMin@ALSGlobal.com

USA — Reno
T +1 775 356 5395
E ClientServicesUSA@alsglobal.com