Crustal versus source processes on the Northeast volcanic rift zone of Tenerife, Canary Islands

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The Miocene-Pliocene Northeast Rift Zone (NERZ) on Tenerife is a well exposed example of a major ocean island volcanic rift. We present elemental and O-Sr-Nd-Pb isotope data for dykes of the NERZ with the aim of unravelling the petrological evolution of the rift and ultimately defining the mantle source contributions.

Fractional crystallisation is found to be the principal control on major and trace element variability in the dykes. Differing degrees of low temperature alteration and assimilation of hydrothermally altered island edifice and/or sediments elevated the primary $\delta^{18}O$ and the Sr isotope composition of many of the dykes, but had little to no discernible effect on Pb isotopes. Minor degrees of sediment contamination, however, may be reflected in the Pb isotope composition of a few samples that plot to slightly higher $^{207}Pb/^{204}Pb$ values.

Once the data are screened for alteration and shallow level contamination, the underlying isotope variations of the NERZ reflect a mixture essentially of Depleted Mid-Ocean Ridge-type Mantle (DMM) and young High-μ (HIMU, where $\mu = {}^{238}U/^{204}Pb$)-type mantle components. Furthermore, the Pb isotope data of the NERZ rocks ($^{206}Pb/^{204}Pb$ and $^{207}Pb/^{204}Pb$ range from 19.591-19.838 and 15.603-15.635, respectively) support a model of initiation and growth of the rift from the Central Shield volcano (Roque del Conde), consistent with latest geochronology results [1]. The similar isotope signature of the NERZ to both the Miocene Central Shield volcano and the Pliocene Las Cañadas central edifice suggests that the central part of Tenerife Island was derived from a mantle source of semi-constant composition through the Miocene to the Pliocene. This can be explained by the presence of a discrete "blob" of HIMU material, ≤ 100 km in vertical extent, occupying the melting zone beneath central Tenerife throughout this period. The most recent central magmatism on Tenerife appears to reflect greater entrainment of DMM material, perhaps due to waning of the blob with time.

[1] Carracedo *et al.* (2011) *Bull. Geol. Soc. America*, **123,** 562-584.

Uranium mineralogy and factors of stability in the mill tailings of the COMINAK mine at Akouta (Niger)

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The world's largest uranium underground mine, at Akouta (Niger), has been mined for more than 30 years. Since that time, around 14 million tons of mill tailings were accumulated on site. After the processing of the ore, with an extraction process efficiency reaching ~95%, some U is left within the mill tailings. Some U reconcentrations may be observed in the storage heap, pointing out potential migrations. This study aims at an assessment of U mobility for revaluating/rehabilitating mill tailings stored in heaps and preventing any U releases in the environment.

The ore deposit occurs in continental lower Carboniferous sandstones, containing quartz and feldspar with detrical clays and organic matter. Pitchblende is associated with minor coffinite, U-Ti and U-Mo oxides, with an average U concentration of 4‰ associated to trace metals (V, Zr, Mo…). Ore processing is based on an oxidative dissolution in sulfuric acid. As a result, a gypsum-indurated duricrust is formed at the upper surface of the tailings heap, referred to as a gypscrete crust.

Gypscrete samples were analyzed using different mineralogical methods: SEM, TEM, electron microprobe, XRD and cathodoluminescence. Micrometer-size U-bearing phases are observed: UO_2, U-Ti oxides (brannerite-type) and secondary phases such as uranyl phosphates. At the nanometer scale, supposedly neoformed U phases are associated with clay minerals, together with evidence of U sorption.

Brannerite-type minerals are most likely inherited from the ore, as they are more resistant than uraninite to the process. Such as UO_2 included in quartz grains, they appear as stable hosts for U. The main source of U^{VI} may rather come from more accessible U-rich phases which have suffered from oxidation and solubilization. The formation of secondary U minerals, in association with U sorption on clay minerals, may delay U^{VI} transport. The comparison of ore samples with their associated tailings sampled before their storage, provides complementary data on the processes governing U mobility.