Supplementary Information

# Isotope calculations for lithospheric amphibole melting

To test whether the model of lithospheric amphibole melting can principally result in the Nd-Pb isotopic compositions of group 1 samples from Henry Seamount, we tentatively calculated a mix between present-day melts of these amphiboles and a representative near-primitive El Hierro melt. The Sr isotope ratios were not considered due to their susceptibility to submarine alteration. The input parameters and calculated values are presented in Table S7, below.

 We assumed that the lithosphere was metasomatized 126 Ma ago by crystallization of amphibole veins from the same trachytic melts that have produced a considerable part of Henry Seamount. These are represented by trachytic rocks dredged at two locations (Klügel et al., 2011). By using the average present-day isotopic and trace element composition of the trachytes, we calculated the initial isotopic composition of these melts and their amphiboles. The trace element composition of the amphiboles was calculated using the trachyte composition and the partition coefficients from Adam and Green (2006) as a first-order approximation. With this data the present-day Nd-Pb isotope composition of the amphiboles after 126 Ma of radiogenic ingrowth was calculated.

 For a near-primitive El Hierro melt we chose the composition of sample JMDDEH11 of Day et al. (2010) having 11.6 wt% MgO. This composition was mixed with the metasomatic amphibole composition (i.e., a high-degree melt of the amphiboles) in a 1:1 ratio. The resulting melt has a Nd-Pb isotopic composition very similar to group 1 samples. We note that there is little change in the calculated isotope ratios even if the trace element composition of sample JMDDEH11 rather than of the Henry Seamount trachyte is used.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sm | Nd | U | Th | Pb | 143Nd/144Nd | 206Pb/204Pb | 207Pb/204Pb | 208Pb/204Pb |
| Henry trachyte, present-day | 6.3 | 44.8 | 6.4 | 18.7 | 6.8 | 0.512884 | 19.562 | 15.611 | 39.805 |
| Henry trachyte, initial (126 Ma) | 6.3 | 44.8 | 6.4 | 18.7 | 6.8 | 0.512811 | 18.342 | 15.552 | 38.638 |
| Amphibole, initial (126 Ma) | 1.9 | 9.0 | 0.025 | 0.065 | 0.476 | 0.512811 | 18.342 | 15.552 | 38.638 |
| Amphibole, present-day | 1.9 | 9.0 | 0.025 | 0.065 | 0.476 | 0.512920 | 18.414 | 15.555 | 38.699 |
| Primitive melt (JMDDEH11) | 11.2 | 56.2 | 1.16 | 4.69 | 2.89 | 0.512930 | 19.634 | 15.610 | 39.334 |
| Amphibole-melt mix 1:1 | 6.6 | 32.6 | 0.59 | 2.38 | 1.68 | 0.512929 | 19.462 | 15.602 | 39.244 |

**Table S7:** Input parameters and calculated trace element and isotope compositions of the simple amphibole assimilation model.

References:

Adam, J., Green, T., 2006. Trace element partitioning between mica- and amphibole-bearing garnet lherzolite and hydrous basanitic melt: 1. Experimental results and the investigation of controls on partitioning behaviour. Contributions to Mineralogy and Petrology, 152: 1-17, doi: 10.1007/s00410-006-0085-4.

Day, J.M.D., Pearson, D.G., Macpherson, C.G., Lowry, D., Carracedo, J.C., 2010. Evidence for distinct proportions of subducted oceanic crust and lithosphere in HIMU-type mantle beneath El Hierro and La Palma, Canary Islands. Geochimica et Cosmochimica Acta, 74(22): 6565-6589.

Klügel, A., Hansteen, T.H., Bogaard, P.v.d., Strauss, H., Hauff, F., 2011. Holocene fluid venting at an extinct Cretaceous seamount, Canary archipelago. Geology, 39: 855-858.