The geochemistry and petrogenesis of Shona MORB

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Introduction
The MORBs have been extensively studied in the South Atlantic region (Le Roux et al., 2002) and the trace element and isotopic data of the tholeiites helped to distinguish the E-MORB that were influenced by the Shona and Discovery plumes from the N-MORB that were derived by the partial melting of the depleted asthenospheric mantle. Nevertheless the MORB genesis is not yet completely understood and a melt inclusion study in the Shona ridge, that it was not yet done in the region, offers a great opportunity to define better the source end-members, to give constraints on the mantle partial melting and about the magma differentiation.

Technique of analysis
The melt inclusions of the Shona ridge were analyzed for major elements by EPMA, for trace elements by LA-ICPMS and for H₂O by FTIR at the Earthquake Research Institute, The University of Tokyo. RSD is generally good (<20%) for most of the elements with only Ta, Th and U that sometimes exceed 30% due to their very low abundances.

Results
The melt inclusions are quite homogeneous for major elements and H₂O, being very similar to reference basaltic glasses (Le Roux et al., 2002), whereas they are very variable for the trace elements and in the same specimen we can distinguish even three types of melt inclusions, that are E-MORB, N-MORB and low HFSE.

Magma plumbing system
The E-MORB and N-MORB characters are considered to be primary and should be derived by the partial melting of different sources that are the Shona plume and the depleted asthenospheric mantle. Their occurrence in the same specimen gives constraints about the magma plumbing system and here we present a suitable model.

N-MORB
The Shona N-MORB melt inclusions are typical N-MORB for major elements, but are quite different from global average N-MORB as regards the trace elements, particularly for having anomalously high Ba/Nb ratios and newly found Sr and Eu positive anomalies. The previous models of mantle partial melting for the South Atlantic and for the Central Indian MORB consider the presence of a recycled oceanic crust and marine sediments within the depleted asthenospheric mantle and here we present a model that fit with these new data.

E-MORB
The Shona E-MORBs are generally mildly enriched and we found the same character in the melt inclusions. It is probable that the Shona end-member is not preserved in the oceanic crust because the extremely enriched melts should have partially mixed with the depleted melts before effusion.

Low HFSE melt inclusions
A few low HFSE melt inclusions were analyzed by LA-ICPMS and according with these preliminary results they should not be primary. They are quite different from the primary ultradepleted melt inclusions occurring in the olivines of the FAMOUS area (Sobolev and Shimizu, 1993), because they do not show a positive correlation Na₂O-TiO₂ and because the depletion of trace elements is evident only for HFSE and not for the other incompatible elements. Here we discuss their genesis considering their chemical composition, their texture and their distribution.