Organic chemistry and the riddle of the pre-RNA world(s)

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The lecture will survey experimental contributions to the pre-RNA-world problem from past and current organic chemistry and will focus on recent results obtained in the author's laboratory.

Os, Sr, Nd, Pb isotopic systematics in basalts and carbonatites from Fogo Island, Cape Verde

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Previous trace element and isotope data of basalts from Cape Verde archipelago have shown a difference between the northern and southern islands.

Here we focus on Fogo island (southern group) and report Os-Sr-Nd-Pb systematics on 17 basalts and 2 carbonatites. Except one sample, basalts present $^{187}Os/^{188}Os$ ranging from 0.13197 to 0.13694 and concentrations from 4.8 ppt to 28.6 ppt. Sr-Nd-Pb isotopic compositions are in the southern island range [1,2,3]. Basalts define positive correlations in lead-lead diagrams and negative correlations in Pb-Sr and Sr-Nd diagrams, significantly steeper than the classical mantle array in the latter. These correlations are interpreted as a mixing between a moderate 'high μ' end-member and an enriched end-member identified as Sub-continental lithospheric Mantle (SCLM). Os isotopic data coupled with other systems show unexpected negative Pb-Os and positive Sr-Os correlations that imply radiogenic 187Os/188Os for the EMI-like end-member.

Both carbonatites present similar isotopic composition with $^{187}Os/^{188}Os$ = 0.17; $^{87}Sr/^{86}Sr$ = 0.703158; $^{143}Nd/^{144}Nd$ = 0.512930; $^{206}Pb/^{204}Pb$ = 19.5; $^{207}Pb/^{204}Pb$=15.597; $^{208}Pb/^{204}Pb$= 39.189. Such compositions do not plot on the basalt correlations, precluding carbonatite fluid as the moderate 'high μ' end-member. We rather propose a mixing between a 1.6 Ga recycled oceanic crust and lower mantle material.

Comparisons with trace element and Sr-Nd-Pb isotope data of kimberlites and lamproites suggest that the SCLM involved in Cape Verde source has encountered enrichment in incompatible elements by melt percolation. Such feature and recent works [4,5] on Canary islands lead to propose a partial melting model of SCLM that can generate the whole isotopic composition required for the enriched end-member, especially $^{187}Os/^{188}Os$ up to 0.14, consistent with the unradiogenic Os isotopic ratios of peridotite xenoliths.

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