Evidence for low-Ca, yet not mantle olivine xenocrysts in alkali basalts from West Qinling, central China

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A low-Ca content in olivine within alkali basalts has ever been utilized as inherent feature of disaggregation from the upper mantle. Nonetheless, we, for the first time to our knowledge, report low-Ca olivine xenocrysts with low Fo values (< 87) from alkali basalts, West Qinling, central China. They lack compositional zonings and most of them do not exhibit reaction rims, but minor xenocrysts have high-Ca rims, indicating reaction with high-Ca magmas. These low-Ca olivines possess high V/Sc ratios, implying a highly oxidized environment during crystallization [1]. In contrast, the olivine phenocrysts display pronounced Fe-Mg zonings. The different compositional profile defines a fundamental yardstick to discriminate these two types of olivines. We argue that a low-Ca content is not a diagnostic characteristic of mantle olivine. The low-Ca olivines in alkali basalts from West Qinling probably were probably disaggregated from olivine-bearing cumulate rocks in the lithosphere or from magmatic cumulates (e.g. Alaskan-type complexes). The upwelling magma could have trapped these xenocrysts en route to the surface. This study is of fundamental significance for identifying a new type of olivine xenocryst within intracontinental alkali basalts. This discovery provides new insights into crust-mantle interaction for alkali basaltic magmas during their ascent to the surface.

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[1] Mallmann & O'Neill (2013) *J. Petrol.* 5**4**, 933-949.