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# Breaking Through Alteration: Recovering Primary Geochemical Signatures from Hawaiian Drill Core

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Hawai‘i comprises eight volcanic islands formed by the Hawaiian mantle plume. Covering an age range from ~2.6 to 1.0 Ma, three volcanoes – Ko‘olau, Lāna‘i, and Kaho‘olawe – erupt "Enriched Loa" lava compositions with enriched mantle (EM-I) signatures (high $^{87}Sr/^{86}Sr$ and $^{208}Pb/^{204}Pb$ for a given $^{206}Pb/^{204}Pb$, as well as low $^{143}Nd/^{144}Nd$ and $^{176}Hf/^{177}Hf$). The Enriched Loa geochemical group represents 8.6 % of the archipelago's magmatic volume yet exhibits the greatest isotopic variability of the three main Hawaiian geochemical groups (Kea, Loa, and Enriched Loa). Isotope ratios measured to date span 58 to 69 % of the total change in Pb, Sr, Nd, and Hf isotopic ratios measured across Hawai‘i. The spatial and temporal continuity, together with the extent of geochemical variations of this component, remain poorly understood, with only surficial samples from Lāna‘i and Kaho‘olawe available to date. This methodological study evaluates whole-rock sample preparation methods suitable for recovering the original magmatic compositions from hydrothermally altered drill core. We measured major and trace elements and radiogenic isotope ratios (Pb, Sr, Nd, Hf) in three samples representing low-, mid-, and high-alteration stages. Each sample was processed via three different preparation methods, before powdering: 1) removing weathered surfaces only, 2) removing weathered surfaces and rinsing with ultrapure water, and 3) removing weathered surfaces, rinsing, and hand-picking 2-5mm grains while avoiding secondary mineral growth and vesicular surfaces. All samples for isotopic analysis were acid-leached in 6N HCl prior to elemental purification. Each preparation method yielded results almost entirely within analytical error, with rinsed and hand-picked samples showing closer overlap in analytical error than unrinsed, unpicked samples. Additionally, all samples showed Enriched Loa signatures in radiogenic isotope ratios, as expected given the drill site. Our results demonstrate that careful processing of altered core material combined with acid leaching effectively reveals original magmatic compositions with minimal time-consuming hand picking. Ongoing analysis of 70 drill core samples from the Lāna‘i caldera, spanning 600m, processed using method #2, detailed here, will further constrain the continuity and geochemical heterogeneity of the Enriched Loa component.