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# Trace-element distribution coefficients for pyroxenes, plagioclase, and olivine in evolved tholeiites from the 1955 eruption of Kilauea Volcano, Hawai'i, and petrogenesis of differentiated rift-zone lavas

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## Abstract

Reliable values for mineral-melt trace-element distribution coefficients (*D*) are essential for constructing realistic models of magma evolution based on trace elements. We have determined *D*-values for an extensive set of compatible and incompatible trace elements in clinopyroxene, orthopyroxene, plagioclase, and olivine phenocrysts in two moderately evolved (5.4 and 6.6 wt% MgO), tholeiitic lavas from the 1955 eruption of Kilauea volcano, Hawai'i, using laser ablation-ICPMS. Coexisting melt compositions were obtained by analyses of quenched mesostasis. These *D*-values are consistent with experimental results when major element variations in the host phase are considered. Lattice strain models reproduce many of the partitioning characteristics. The distribution coefficients determined here can be applied to understanding the petrogenesis of evolved tholeiitic magmas from two recent Kilauea eruptions. Trace-element compositions of the 1955 lavas are consistent with 30–40% fractional crystallization of a gabbroic assemblage from an olivine tholeiite parental magma. The reduced influx of melt to Kilauea during the late 19th and early 20th centuries may have allowed the formation of evolved magmas in the rift zone.