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# A Rayleigh model of cesium fractionation in granite-pegmatite systems

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## ABSTRACT

The K/Cs ratios of K-feldspars from granitic pegmatites are compared to models derived from the Rayleigh equation. The K/Cs and K/Rb ratios of K-feldspars and micas exhibit decreasing values when plotted against their Cs or Rb contents across cogenetic suites of granites and pegmatites and from margin to core of individual bodies. The trends in elemental ratios conform to Rayleigh fractionation for the crystallization of feldspars and micas from a silicate melt. Within two individual pegmatite bodies, the K/Cs ratio of K-feldspar initially falls more rapidly than the Rayleigh model predicts. That might reflect a local increase in the concentration of Cs relative to K due to the pile-up of incompatible elements in a boundary layer of melt adjacent to the crystal growth front. The addition of an aqueous solution to the Rayleigh model (i.e., the simultaneous crystallization of K-feldspars from melt and from aqueous solution) predicts high and increasing K/Cs ratios of K-feldspars that are not observed in natural rock suites, except when K-feldspars crystallize in miarolitic cavities or when primary K-feldspar recrystallizes to microcline perthite in an open hydrothermal system. In those cases, the Cs content of K-feldspars falls to nil because of the high solubility of Cs in aqueous solution and low compatibility of Cs in K-feldspar. Otherwise, the observed patterns of K/Rb or K/Cs in K-feldspar and micas in pegmatites conform to crystal-melt fractionation in which an aqueous solution plays no part. From the viewpoint of the geochemistry of Cs in pegmatites, these observations give support to the model proposed by Cameron et al. (1949) and endorsed by Jahns (1953a, 1953b).

**Keywords:** Cesium, Rayleigh fractionation, pegmatite, K-feldspar