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The Relationship of K2O and Na2O in the Generation of Alkaline Magmas: An Experimental Approach

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The generation of alkaline magmas by mantle sources has been subject of intense debates in the last few decades. Several experimental studies have been developed to better understand the conditions to generate such magmas, but these works considered the influence of K2¬O and Na2O separately. We conducted a series of experiments under HPHT conditions on a hydraulic press with coupled toroidal chambers (at 4.0 GPa and temperatures between 1100oC and 1400oC) on the systems nepheline-leucite-diopside and kalsilite-leucite-diopside, at anhydrous conditions, to understand how the activity alkaline elements, with different silica concentrations, behave in mantle conditions. The experiments were analyzed ex situ with X-ray diffraction, SEM-EDS, and EPMA-WDS. Our results show that a thermal high separating ultrapotassic from potassic and sodic liquids exist in such conditions, and that this thermal high helps us to understand how alkaline rocks are formed through time and space, since that a specific relation exist between potassic and sodic rocks. This is also due to a positive relation between the concentration of silica in the system and the activity of K2O.