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Experimental study on the kinetics of magnesiohornblende dehydration and its implications

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Abstract

Magnesiohornblende dehydration was studied using both high-temperature thermogravimetric analysis and high-pressure differential thermal analysis (HP-DTA). The high-temperature thermogravimetric analysis results revealed that magnesiohornblende dehydration at high temperatures could be divided into three steps: 848–1058, 1058–1243, and 1243–1473 K, and each step followed an *n*-order reaction (*Fn*). The dehydration process is characterized by an oxidation-dehydrogenation mechanism, and the dehydration of the last step can be explained as the direct decomposition of the hydroxyl groups connected to the magnesium ions. The HP-DTA of magnesiohornblende dehydration under pressures of 0.5, 1.0, 2.0, and 3.0 GPa revealed the occurrence of two endothermic peaks, indicating that the dehydration occurs in two steps at high temperature and pressure. Our experimental results reveal that during subduction, the fluid released during the dehydration of magnesiohornblende may trigger earthquakes and cause high electrical conductivity anomalies in the subduction zones.

Keywords: Magnesiohornblende, dehydration, thermogravimetric analysis, high-pressure differential thermal analysis (HP-DTA), subduction zones