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Research on the process of amphibole losing water may reveal the temperature gradient inside the planet

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Amphibole, a chain silicate mineral, is an important rock-forming mineral on the earth and a hydrous mineral reported in lunar and Mars exploration. Due to its complex chemical composition and crystal structure, amphibole response to temperature is multi-stage and complex. In this paper, amphibolite's systematic heating experiment is carried out under medium to high temperature (600–1180°C). Raman observations show magnesiohornblende was thermal decomposition to form augite at 1000–1050°C and transform to diopside at a higher temperature. The Raman peak of OH stretching in the range of 3500–3800 cm^{-1}, the νs of O-Si-O peak near 936 cm^{-1}, and the OH libration peak between 50-400 cm^{-1} for amphibole are shown typical migration characteristics, which indicated that the process of dehydration and transformation of amphibole into pyroxene is: the Na, K in A-site, and Al in *T*(1) site of amphibole preferred to migrate, which shortened the distance between tetrahedrons and caused the O-Si-O bond connecting tetrahedron and octahedron *M*(4) to break. Thus, the Ca in *M*(4) site moves into the vacant A sites and forms pyroxene together with Si-O-Si at the site of *T*(1)-*T*(1). This study's results reveal the variation characteristics of the Raman peak position of amphibole under different temperatures, which may be used to indicate the temperature gradient inside the planet.