

# Compressional Behavior of Hydrous Orthoenstatite

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## Abstract

The Mg-rich orthoenstatite (OEn) phase is one of the major mineral phases at the upper part of the Earth's interior (within the thickness of 400 km, so-called the upper mantle). In terms of crystal chemistry, the pyroxene phase is a “nominally anhydrous mineral (NAM)”. Field specimens show that the OEn phase often contains some amount of “water” within the crystal structure, up to 600–800 ppm, usually incorporated as hydroxyl, OH<sup>-</sup> [1]. It is well-known that the crystal chemistry (e.g., H<sup>+</sup> concentration and minor elements) of mineral phases could have a different influence on the physical properties [2]. To understand how the detailed crystal structure was influenced by adding the water and Al, single crystal X ray diffraction analysis was performed for a suite of hydrous orthoenstatite. By comparing the results obtained at ambient conditions, we find that for low-level of Al-content, <2 wt. %, the Al<sup>3+</sup> cation tends to occupy one of the tetrahedral sites (TB) only. Analysis of the X ray diffraction results under high pressure indicates that the elasticity of orthoenstatites is insensitive to the presence of low-level water and Al. We use this finding to discuss the possible origin of the low-velocity zone at the upper mantle [3].

**Keywords :** *hydrous pyroxene, high pressure, X ray diffraction, compressional behavior.*

## References

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