

Abstract Submitted
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Termination and hydration of ultramafic mineral surfaces: Forsterite (010) and Diopside (010) surfaces¹ HONGPING YAN, CHANGYONG PARK, Carnegie Institution of Washington — The weathering and hydrous alteration processes of ultramafic rocks (Serpentinization) are known to contribute to abiotic hydrocarbon generation in near surface region of the planet. Atomic level characterization of the interface between water and mineral surface, which plays crucial roles in mineral weathering and dissolution, is highly demanded to better describe the processes in molecular scale. We use in-situ high-resolution X-ray reflectivity to examine the natural forsteritic olivine (010) surface and diopside (010) surface in aqueous conditions. By modeling the electron density profile in surface normal direction and fitting the measured data with least-square method, the atomic structures of hydrated mineral surfaces are depicted. We found, for alumina polished forsterite surface under acidic environment, a homogeneous termination with about half of the magnesium depleted and replaced with possibly the hydronium ions. In contrast, the silica polished forsterite does not show such homogenous surface, as confirmed by ex-situ Atomic Force Microscopy measurements. In comparison, the diopside (010) surface is naturally grown without any polishing but, interestingly, it shows qualitatively identical features to forsterite (010) in terms of the termination and the first adsorbed water structures. These results indicate a common chemical characteristic of these mineral surfaces interacting with water, despite the distinguishing silica ratios and silicate structures they have.

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