

# **The effect of volatiles CO<sub>2</sub> and H<sub>2</sub>O on the mechanical properties of silicate melts**

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Fluids and melts are the most important vectors for fast mass transportation in the Earth mantle once the crystallization of the magma ocean was completed. Deep seated mantle plumes, kimberlitic plumes, carbonatitic and komatiitic eruptions dominated the fast dynamics of the early Earth.

Here we study the effect of volatiles CO<sub>2</sub> and H<sub>2</sub>O on the mechanical properties of silicate melts with such realistic compositions, characteristic for the Earth's upper mantle.

For this we employ ab initio molecular dynamic simulation based on density-functional theory (DFT) as implemented in the VASP 6 package. We compute equation of state along several representative isotherms. We study the chemical speciation and its behavior as a function of pressure and temperature. From the self-correlation analysis of the shear components of the stress tensor we derive the viscosity of the melts. We place our results in the general context of the Earth upper mantle.