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Iodine speciation in basaltic melts at depth

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The speciation of iodine in basalts has been investigated by combining in situ X-ray diffraction at high pressures and temperatures up to 4.9 GPa and 1600°C, and Raman spectroscopy on recovered high pressure glasses at ambient conditions [1]. Both methods point to iodine being oxidized in basalts, whether molten or quenched as glasses. Observed interatomic distances and Raman vibrational modes are consistent with iodine being dissolved as complex iodate groups alike polyiodates or periodates, not as IO_3^- groups. Iodine speciation in basalts therefore seems to reflect a trend amongst halogens, with lighter chlorine bonding to network modifying cations, and bromine changing affinity from network modifying cations to oxygen anions under pressure. In the absence of a fluid aqueous phase, iodine could thus reach the Earth's surface in basaltic magmas as an oxide, not as a reduced species.

[1] Sanloup et al. (2024), CR Geosciences 356, 23-33.