Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.6565

ELEMENTAL AND ISOTOPIC INSIGHTS INTO VOLATILITY PROCESSES FROM STUDIES OF TEKTITES

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Tektites are glasses derived from terrestrial debris ejected from the Earth's surface during hypervelocity meteorite impacts. These objects were rapidly heated, molten, and quenched over timescales that are likely to capture kinetic effects related to volatility. As such, they serve as natural experiments by which to constrain the effects of volatility processes, with applications ranging from the pre-solar nebula to modern igneous processes.

Tektites have undergone extreme depletions in volatile species, notably H_2O [1], and moderately volatile elements (MVE; e.g., Cu [2], Zn [3], Sn [4]). They are among the driest terrestrial samples, although the exact mechanism of water loss and the behaviour of other volatile species during these processes are debated. Differences in the extent of these depletions reflect parameters such as the compositions of precursor rocks, conditions under which each group formed, and the size and trajectories of the individual specimens, with more proximal specimens generally being larger and less volatile depleted. Furthermore, isotopic fractionation, as documented in some MVE, reveal preferential loss of light isotopes into the vapour phase, providing insights into the relative volatility behaviour of different isotope systems that have implications beyond tektites themselves.

We present a new and novel dataset for a large suite of tektite samples representing different impacts and sources. This dataset include major elements (EPMA), trace elements (LA-ICPMS), water analysis (SHRIMP-SI), as well as isotopic studies of Sn, Cu and Zn (MC-ICPMS). This comprehensive dataset permits new insights into the formation of tektites and the effects of volatility processes on MVE isotope systems.

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