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Recent developments in the structure of high temperature oxide melts

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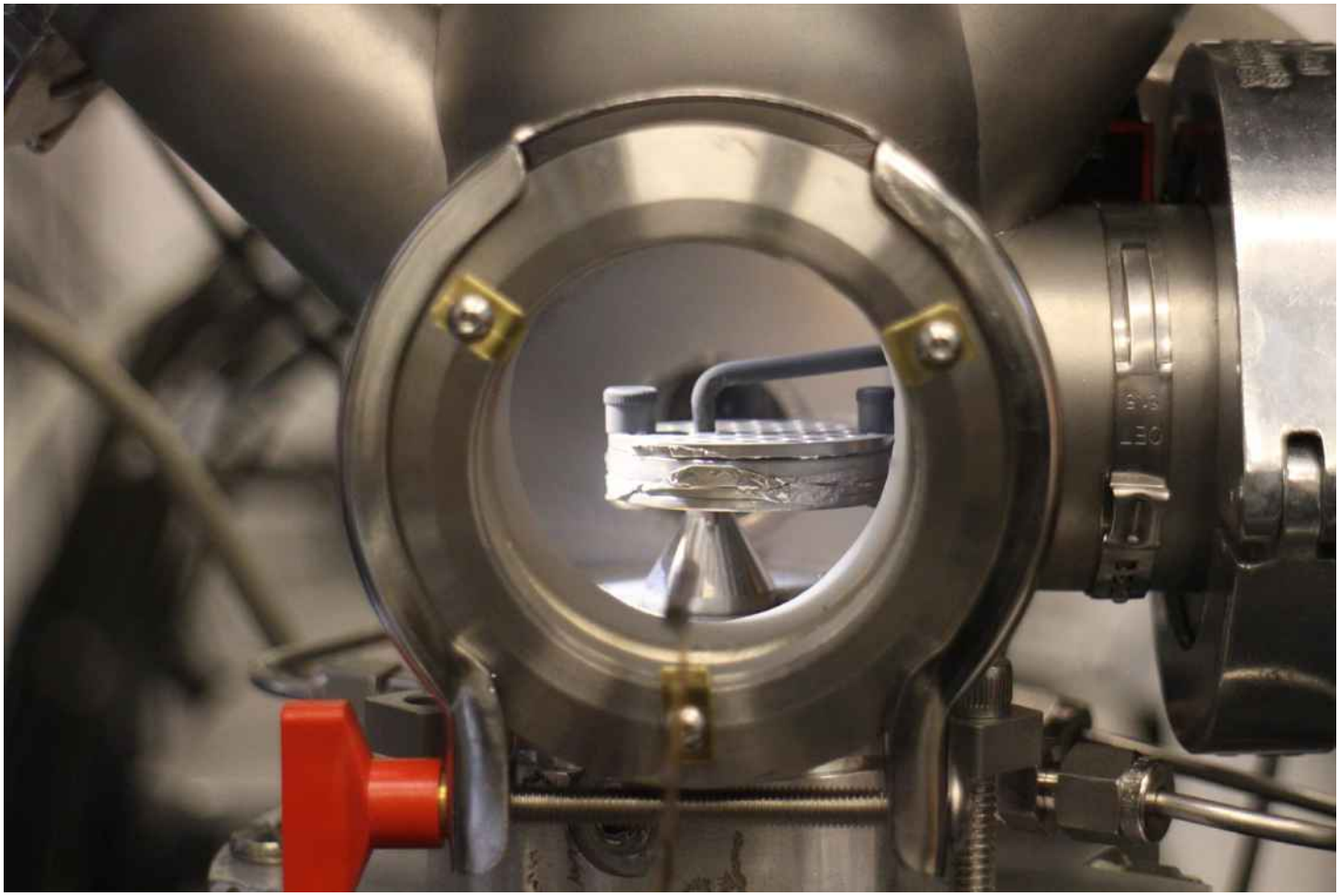
Aerodynamic levitation with laser heating has now become a standard technique for studying the structure of oxide melts on synchrotron and neutron beamlines. Here we summarize the results of a growing number of findings that show a distinct decrease in the local cation-oxygen coordination number, for liquid state single and binary oxides, compared to their crystalline forms. This phenomenon is often correlated with a significant decrease in density upon melting and diffraction measurements show a distribution of lower coordinated polyhedra. The diffraction data allow us to refine interatomic potential parameters within molecular dynamics simulations to obtain very good agreement between the structural models and experiments. The feasibility of very high temperature experiments around and above 3000 degrees Celsius, as well as the safety aspects associated with measuring radioactive samples will be discussed. Future prospects on changing the oxidation state of high temperature oxide melts through reduction-oxidation reactions will also be considered. The photograph below shows a Uranium dioxide pellet being loaded into the aerodynamic levitator on a high energy x-ray beam line at the APS prior to melting.

[1] *L.B. Skinner, C.J. Benmore, J.K.R. Weber, et al., "Low cation coordination in oxide melts", submitted.*



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