

Properties of Liquid Silicon and Carbon Studied by Ultrafast X-Ray Absorption Spectroscopy

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Time-resolved absorption spectroscopy can be used to measure the electronic and structural properties of highly volatile states of matter created by the rapid heating of thin foils with ultrafast laser pulses. Experiments at ALS beamline 5.3.1 have used this technique to study the L-edges of liquid silicon and the K-edge of liquid carbon. Models of liquid silicon, using a combination of molecular dynamics simulations and the x-ray absorption code FEFF, agree reasonably with much of the experimental data. The data on liquid carbon suggest an sp bonding geometry, consistent with earlier work to simulate the "low-density" phase of liquid carbon.