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Study of Short-Range Order in Supercooled Liquid Silicon by Beam-Line Electrostatic Levitation (BESL)[1] T.H. KIM, G.W. LEE, A.K. GANGOPADHYAY, K.F. KELTON, Washington University, St. Louis, B. SIEVE, A.I. GOLDMAN, Iowa State University, Ames, T.J. RATHZ, J.R. ROGERS, NASA MSFC, Huntsville, R.C. BRADSHAW, R.W. HYERS, University of Massachusetts, Amherst — Previous studies of the liquid structure of supercooled Si by x- ray diffraction using electromagnetic and aerodynamic levitation have produced conflicting results. We describe a BESL technique that obtains complete diffraction patterns in 0.1 s using high- energy synchrotron x-rays, allowing the evolving structures of supercooled liquids to be measured continuously. Contrary to some molecular dynamic simulation studies, no first order liquid- liquid phase transition was observed in supercooled liquid Si over the measured temperature range (1100 °C to 1600 °C). The coordination number remained constant, in conflict with earlier measurements. Modeling suggests that the A5 structure of liquid Si distorts continuously toward cubic diamond structure with decreasing temperature.

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