

Measuring the Viscosity of Liquid Sulfur by Proton Microscopy

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Sulfur exhibits an unusual dependence of viscosity on temperature. An experimental setup was developed to study the viscosity of sulfur at pressures up to 100 bar and temperatures up to 500°C. Proton radiography was used to visualize the fall of a tungsten carbide ball placed in molten sulfur. The experiment was conducted using the PRIOR II proton microscope (GSI Helmholtz Centre for Heavy Ion Research, Darmstadt, Germany). In this experiment, the SIS-18 accelerator operating mode with slow beam extraction was used for proton radiography for the first time. The viscosity of molten sulfur was measured at a pressure of 90 bar and temperatures ranging from 190 to 320°C. It has been shown that impurities, including hydrogen sulfide, which appears in the sulfur melt at high temperatures, have a significant effect on the viscosity of sulfur.