

System of the high pressure X-ray radiography measurement at the SPring-8

Ken-ichi Funakoshi[1]; Akifumi Nozawa[1]

[1] JASRI

High pressure X-ray radiography experiments have been started from 1999 in BL04B1 beamline at the SPring-8. In this beamline, high energy white X-ray is available for the viscosity measurement or the direct observation of sample deformation or melting, combining with the high pressure apparatus (SPEED-1500) and the radiography technique. Here, we introduce the system of the high-pressure X-ray radiography measurement at the SPring-8.

The system of the high pressure radiography measurement are composed by a beam monitor which consists of the fluorescence screen and lens, a CCD camera, and a personal computer for imaging analysis. Because of the very high energy of white X-ray from the synchrotron radiation, YAG(Ce) mono crystal is available for the fluorescence screen. The transmitted X-ray from the high pressure sample in SPEED-1500 is visualized by a beam monitor, and then detected by a CCD camera. Real-time images of the sample are captured and recorded in a computer.

As the first high pressure X-ray radiography experiments at the SPring-8, the viscosity measurements of albite melt have been carried out using the falling sphere method. A Pt sphere with a diameter of 100 microns was used as a falling sphere, and its real time images of Pt sphere sinking in albite melt were captured at intervals of 1/30 seconds. As the precise terminal velocities of the sinking spheres were determined, the reliable viscosities of albite melts have been obtained up to 6 GPa using Stokes's law. Recently, a new X-ray radiography system with a high speed CCD camera has been installed, and each image data can be captured at intervals of 1/125 seconds. This is the fastest high pressure X-ray radiography system in the world. The system has been applied to viscosity experiments of the metal melts with very low viscosities. We have applied it to the Fe-FeS melts up to 9 GPa.