

Past, Present and future of high pressure X-ray radiography

Masami Kanzaki[1]

[1] ISEI, Okayama Univ.

High pressure X-ray radiography was born at Photon Factory at around 1985. This technique observes X-ray radiographic image of a sample under pressure, utilizing a gap between anvils due to gasket in a multi-anvil apparatus. The technique has been applied for falling sphere viscosity measurements of silicate melts under pressure, though, contamination from a pressure medium made of boron-epoxy resin has been the problem. However, an advent of third generation synchrotron made the use of boron-epoxy resin obsolete, and viscosity measurements using the technique have been done afterward. At the same time, the technique has been applied to other issues, such as for deformation experiments, interdiffusion of melts, and in-situ observation of fluid-containing systems. It is well known that transparent nature of diamond anvil cell for visible light made this high pressure technique popular for various in-situ measurements. We think that high pressure X-ray radiography realized this for X-ray region, especially useful for multi-anvil apparatus. Further new applications would be possible, such as in-situ observation of crystal growth, reaction of silicate-metal under pressure, and so on.

In last all studies, a contrast due to X-ray absorption has been observed. However, this does not distinguish two phases with similar absorption. For organic tissues where absorption contrast is very subtle, refractivity contrast has been used to image the sample. We do sometimes observe a contrast due to difference of refractivity in our high pressure experiments. Therefore, the use of refractivity contrast would be important for further development of high pressure X-ray radiography.