Levitation and containerless methods allow enhanced glass formation due to the elimination of extrinsic heterogeneous nucleation. They also enable experiments on high-temperature liquids and deep undercooled liquids without contamination from containers. Recently, the use of levitation to study liquids and the formation of glasses from liquids has been considered particularly important in understanding the structure of non-glass-forming liquids and the process of glass formation.

We now provide three state-of-the-art levitation instruments, which are for aerodynamic levitation [1], electrostatic levitation [2], and acoustic levitation [3], at the SPring-8 beamlines. Aerodynamic levitation is the most popular levitation technique, because the instrument used for this technique is very compact and works well for a wide variety of materials. We can obtain reliable X-ray scattering data for very high temperature oxide melts, which can be reproduced by a reverse Monte Carlo modeling technique [Fig. 1(d)] [4]. Electrostatic levitation allows us to perform not only X-ray scattering measurement but also in situ thermophysical property measurements.

Acoustic levitation has recently been optimized to levitate low-temperature liquids by using a cryojet [3]. This technique provides us with new potential applications of low-temperature liquids in pharmaceutical [5] and engineering sciences.

The three levitation instruments are usually used at beamline BL04B2. These instruments are planned to be used at other SPring-8 beamlines to enable the combination of different experimental techniques. Since levitation techniques enable us to achieve extremely nonequilibrium states, they can expand the potential application of undercooled liquids to not only fundamental sciences but also novel nonequilibrium material production from deep undercooled liquids.

Reference

Call for Research Proposals
http://www.spring8.or.jp/en/users/proposals/call_for/

www.spring8.or.jp