Chapter 5

Conclusions and Future Work

The work in this thesis was motivated by a desire to propose a new endstation for an x-ray absorption experiment on solid and liquid phase samples at one atmosphere. Such the endstation will be useful for study phase-effects of a molecule by the NEXAFS technique.

5.1 Conclusion

A new endstation was designed and developed at beamline 9.3.1 of the ALS to perform x-ray absorption experiments with soft x-rays on solid and liquid samples at atmospheric pressure. A newly designed sample holder leads to ease of use and less time consumed from sample loading to starting measurement. It takes only few minutes to change low-vapor-pressure liquids and slightly longer for high-vapor-pressure liquids due to the pre-cooling process. These simple and inexpensive cooling methods allow us to conduct experiments on x-ray absorption of relatively high-vapor-pressure liquid samples.

Chlorine K-edge Near-Edge X-Ray Absorption Fine Structure (NEXAFS) spectra for the selected small molecules of chlorine compound including dichloromethane (CH_2Cl_2), trichloromethane($CHCl_3$), tetrachloromethane(CCl_4) and trichlorofluoromethane (CCl_3F) in solid, liquid and gas phases have been successfully measured. Some preliminary investigations of the deviations in NEXAFS spectrum and their evaluation were conducted. The results have demonstrated potential use of the NEXAFS to finger print Cl compound as well as to study of electronic transition with phases of the molecules.

5.2 Future Work

The work presented in this thesis has developed a new endstation for an x-ray absorption experiment on solid and liquid phase samples at one atmosphere. Chlorine K-edge Near-Edge X-Ray Absorption Fine Structure (NEXAFS) spectrum for the selected small molecules of chlorine compound has been measured and analyzed to demonstrate potential use of the technique. However, this technique is not yet valuable characterization for phase transitions. For this to become possible, more detailed studies of the modeling & simulation are required. Future developments extending the endstation from this work, should be *in situ* investigation of sample during phase transition which can be done by precisely control the temperature and of the system.