ESRF	**Experiment title:** Microtomography experiments on immiscible Fe-S-Si liquids. Implications for planetary differentiation.	**Experiment number**: **ME1254**
Beamline: ID19	**Date of experiment**: from: Dec.6 2006 to: Dec.9 2006	**Date of report**: 20/02/2007
Shifts: 12	**Local contact(s)**: E. Boller	*Received at ESRF:*

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Report:

In this study, we made the first *in situ* 3D microtomography experiment at high pressure and high temperature studying the percolation process of metallic phase through an olivine matrix. This topic, relevant to core formation during planetary differentiation, has only been studied on quenched samples [1, 2] or using *in situ* indirect probes by electrical resistivity measurements [3]. By studying directly the melt distribution at high pressure and high temperature, we would bring direct arguments for the discussion concerning early stage of the solar system.

For this experiment, we developed a set up to install VX5 type Paris Edinburgh press on a microtomograph available on ID19 (Figure 1a). This press has an open angle of 140° plus 5° access through pillars. A spring system reduce the weight applied on motors.

X-ray transparent boron epoxy gasket was compressed between two WC opposed anvils. The cell assembly consisted in a graphite cylinder as resistive furnace and a polycrystalline MgO capsule as pressure medium and sample container. Samples have 1mm of diameter and 500 microns in height, accessible between WC opaque anvils. The incident X-ray beam was monochromatized at 24keV energy. The FReLon camera installed on the microtomograph allowed a 2*2 microns resolution, down to 1*1 microns for quenched samples (Figure 1b).

Samples consisted in powder mixtures between 10%wt of finely grinded Fe-27%wt S powder, corresponding to Fe-FeS eutectic composition at 3 GPa, and 90%wt San Carlos olivine grains with a few microns size. We investigated one pressure (3 GPa) and several temperatures (from 1000 K to 1800 K).

3D reconstruction of HP-HT samples is still in progress. This work is conducted through collaboration with ID19 staff (E.Boller and P.Tafforeau) and ID22 staff (P.Bleuet).

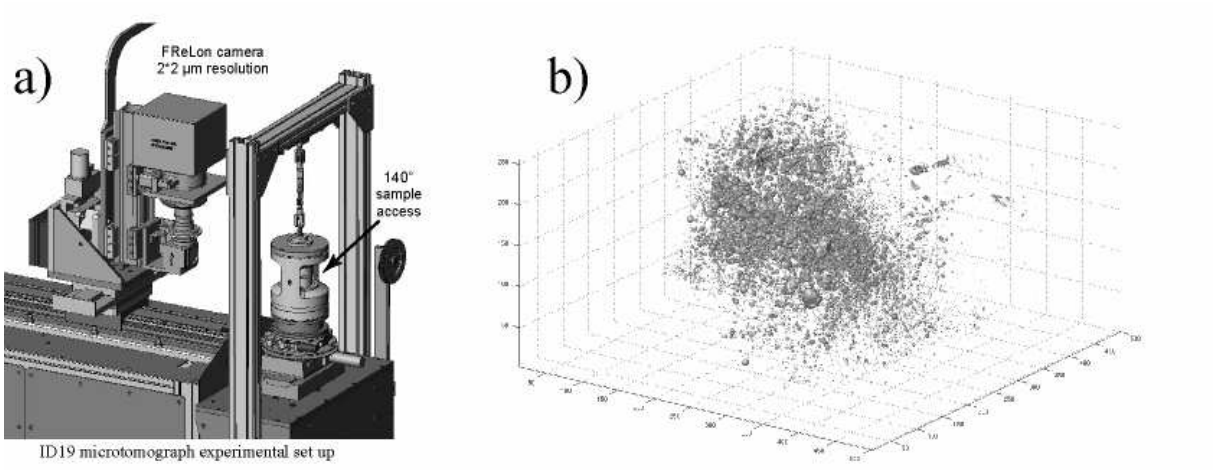

Figure 1: a) Experimental set up developed on ID19 for in situ 3D tomography experiments at high pressure and high temperature. b) 3D reconstruction of quenched sample. Metallic blobs could be distinguished.

References

[1] M.C. Shannon, C.B. Agee, Percolation of core melts at lower mantle conditions, Science 280(1998) 1059-1061.
[2] W.G. Minarik, F.J. Ryerson, E.B. Watson, Textural entrapements of core-forming melts, Science 272(1996) 530-532.
[3] T. Yoshino, M.J. Walter, T. Katsura, Core formation in planetesimals triggered by permable flow, Nature 422(2003) 154-157.