

The Paris-Edinburgh cell combined with a T-cup module for X-ray diffraction at high pressure and temperature

Y. Le Godec¹, G. Hamel¹, D. Martinez-Garcia², T. Hammouda³, V.L. Solozhenko⁴,
W. Crichton⁵, M. Mezouar⁵ and S. Klotz¹.

¹ Physique des Milieux Denses, IMPMC, Université P&M Curie, Paris, France
(yl@pmc.jussieu.fr)

² DFA, University of Valencia, Valencia, Spain

³ LMV, University Blaise Pascal, Clermont-Ferrand, France

⁴ LPMTM-CNRS, University Paris Nord, Villetaneuse, France

⁵ ESRF, Grenoble, France

The ‘Paris-Edinburgh’ (PE) cell is currently used for a wide range of measurements such as neutron and X-ray diffraction, EXAFS, Compton scattering, inelastic neutron and X-ray scattering, and ultrasonic studies. This method provides excellent powder statistics, well defined and almost uniform temperature conditions, allows the study of liquids at high (P,T) and enables to recover macroscopic samples.

One of the limitations of the standard design of the PE cell so far is its accessible (P,T) domain, restricted to ~ 10 GPa and 2000 K. However, *in situ* X-ray diffraction studies at conditions beyond these limits are extremely attractive in various domains of research. To overcome these limitations, we have designed a new high pressure set-up for *in situ* angle-dispersive X-ray diffraction studies under high (P,T) using the V7 type Paris-Edinburgh press. The V7 has a capacity of 450 tonnes, i.e. almost twice as the standard press, but still a weight of less than 80 kg. The ~ 20% larger overall dimensions allow to accommodate a two-stage multi-anvil system similar to the Stony Brook “T-cup system” which operates routinely to 25 GPa and 2500 K. The advantage of such a combined V7-T-cup system is its extreme compactness compared to all other multi-anvil systems currently existing on other synchrotron sources. The reduced dimensions and weight allow to transport it easily between laboratories and to install it in almost any experimental hutch within ~2 hours. It offers also the considerable advantage of being able to work with several presses simultaneously, i.e. carry out experiments with one cell whereas other presses are being prepared for the following measurements. We present this new high-pressure set-up as well as first results obtained in both off-line and on-line experiments at the ESRF [1].