An Experimental Design for Low Pressure and High Temperature	X17B1

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While people are striving for higher and higher pressure to study the physical properties of materials under high pressure, there still are many demands for in situ x-ray diffraction experiments at low pressure (< 1 GPa) and high temperature, for example, phase relation of enstatite and zeolite. Some materials may have a restricted phase stability field below 1 GPa. However, the existing high pressure diffraction designs of a DIA-type press are generally suitable for high temperature experiments at the pressures above 1 GPa. For carrying out a high temperature experiment below 1 GPa, the major problems with a regular 6 mm high pressure cell (Figure 1) is a) unstable electrical contact between anvil and heating component; b) unfavorable pressure control because of the very low required load.

To perform such a low pressure and high temperature experiment, a large anvil truncation high pressure cell was designed (Figure 2). Six steel anvils with the truncation size of 15 mm were used. The size of pressure medium was 20 x 20 x 20 mm. The pressure efficiency was reduced by 1 order so that a good contact was achieved by much higher load at the sample pressure as low as 0.3 GPa. A thermocouple was inserted from one end of the heater to avoid the partial overheating due to the thermocouple hole on the heater sleeve (Figure 1). An experiment was carried out to study the phase boundary between orthoenstatite and protoenstatite. The sample was heated up to 1600 °C at 0.3 GPa. Some diffraction patterns which do not have the characteristics of either phase were observed at the temperature above 1000°C. Further investigation is in progress.

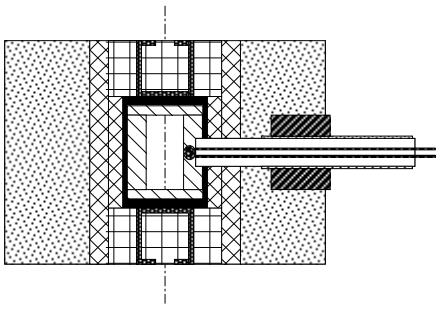

Figure 1. Regular 6 mm high pressure cell assembly for the DIA-type press SAM85.

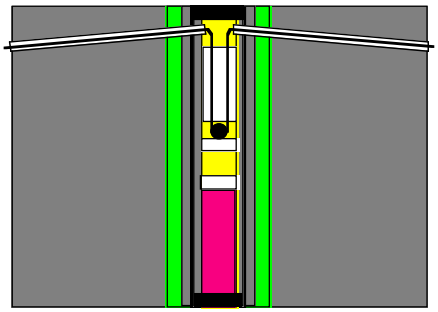

Figure 2. Large volume pressure cell for studies below 1 GPa.