

Low Temperature System for a 3000 Ton Multi-Anvil Press

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Most large volume high pressure devices are capable of high temperature experiments that are typically achieved by using localized resistive heating of a metal foil, graphite or ceramic sleeve inside a thermally insulated sample volume in a high pressure cell. Temperatures below 295K are more difficult to achieve mainly because the massive steel components of the press, which are in good thermal contact with each other under high load, act as large heat reservoirs and pathways that encumber the removal of heat from the pressure cell. We describe a new custom-designed system in development for a 3000 ton multi-anvil press to reach temperatures below 295K at high pressures. The system was designed to remove heat selectively and conductively from the sample volume through six of the eight WC cubes in direct contact with the octahedral pressure cell. Cooling fins made of Cu are sandwiched between, and in thermal contact with, neighboring anvil faces and are each connected to a dedicated Cu heat exchanger chamber through which liquid nitrogen flows. The chamber internal geometry consists of square pillars that double the internal surface area of the rectangular parallelepiped enclosed volume. Gas from each chamber is vented to the lab through an exhaust pipe. Results will be presented of several temperature monitoring points in the center of the pressure cell and on the surfaces of the WC cubes and steel wedges which recorded the time-dependent cooling progress.