

Technology Transfer Opportunities: Partnerships

Computer-Based Temperature Control and Video Overlay System for Use With a Diamond Anvil Cell

About the System

Scientists at the U.S. Geological Survey have developed a computer-based temperature control and video overlay system for use with the diamond anvil cell. The diamond-anvil cell (DAC) is a means for subjecting samples to very high pressures in laboratory experiments. For example, pressures to 100 kilobars can be achieved using the device. In addition, the DAC can subject samples to temperatures ranging from -200 to 1200° C.

How It Works

For most experiments, the DAC is placed under a microscope equipped with a video camera in order to obtain a video record of the experiment. USGS researchers have improved upon this process by adding additional components and writing a computer program that overlays time, temperature, and control parameters on the video record. This information is invaluable when reviewing experiments. The system also includes a monochrome video frame grabber that enables users to capture frames from the video record for image processing. In addition, the system allows users to automatically control temperatures during sample tests by a computer.

Applications of the System

Potential applications of the system are numerous. The DAC has been used to study the effects of pressure and temperature variations on fluids, ceramic materials, and minerals. The DAC and refinements of the DAC have been used by groups interested in physical and chemical properties of the

Earth's mantle and core as well as in materials science, in fluid inclusion observations, and in hydrothermal studies. Examples of specific study applications to date include:

- o the equation of state for minerals and geologic fluids
- o the phase transition of minerals and ceramics
- o the morphology of ice polymorphs and the identification of new ice forms
- o ion-pairing in supercritical mineral fluid solutions
- o dehydration and hydration of clay minerals
- o structure of hydrous melts

Partnership Opportunity

The USGS is seeking partners at universities, research institutes, and private industry who are willing to collaborate with USGS scientists to further develop and commercialize the versatile DAC and the USGS video overlay system.

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For More Information

Additional information about the video overlay system can be obtained by contacting the principal researcher:

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Additional information about partnership and patent licensing opportunities with the USGS can be obtained by contacting the:

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