

High Pressure Preparation and Properties of Polycrystalline Oxides and HalidesA.J. DeLai, R.M. Haag, and J.K. HillAVCO CORPORATION  
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The high pressure research studies conducted in this laboratory have been of three types. Microstructure and physical properties of dense oxides prepared at high pressure and relatively low temperature have been studied. Among the compounds investigated have been alumina, magnesia, and chromia.

In other studies the preparation of "new" materials by "irreversible" transformations at high pressure was undertaken. By this we mean the metastable retention at atmospheric pressure of materials or phases thermodynamically stable only at higher pressure.

Physical measurements, specifically compressibility measurements at high pressure are being undertaken.

We have designed and constructed two belt-type cells. The first offers a sample volume, within the gasket, 0.500 inches in diameter and 1 inch in length. A pressure of one million psi or approximately 70 kilobars can be achieved with this apparatus. The second with a sample diameter of 0.125 inches and the same length is capable of achieving three million psi or approximately 200 kilobars. With resistive heating, temperatures to 1500°C can be obtained in either of these systems. This apparatus consists essentially of a belt type die body with a carbide insert and carbide punches. A 400--ton press is used for operation. The assembly is shown in Figure 1.