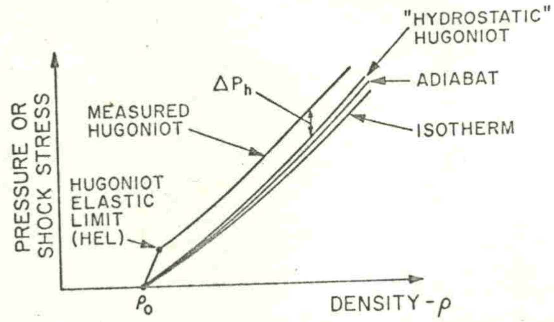

Fig. 2. Pressure or shock stress-density relation for material exhibiting strength effects under shock compression. Measured Hugoniot is offset by a stress, ΔP_h, above 'hydrostatic' Hugoniot. 'Hydrostatic' Hugoniot would be measured if material retained zero strength upon shock compression.

In the present case these materials would include MgO, Al_2O_3, and possibly MnO_2 (Table 6).

Although some initial measurements of P_h and P_p in geologic materials shocked to high pressure are now being made (C. Godfrey, private communication), for the present purposes we have assumed that Al_2O_3 and MgO behave as simple elastoplastic materials. In such materials the maximum shear stress τ_m remains at the constant level which is achieved at the Hugoniot elastic limit. The Hugoniot elastic limit will thus define the maximum shear stress that the material can withstand under one-dimensional compression without internal rearrangement taking place at the shock front. The stress offset, calculated from the value of τ_m at the Hugoniot elastic limit for Al_2O_3 ceramic and for crystal-density polycrystalline Al_2O_3, is 40 and 52 kb, respectively. When these stress offsets are subtracted (at a given density) from the pressures along the Hugoniot, the resulting adiabats obtained from the 'hydrostatic' Hugoniot almost coincide with *Perez-Albuerne and Drickamer's* [1965] hydrostatic X-ray data for Al_2O_3 [*Ahrens et al.,* 1968]. By applying this correction to the Al_2O_3 data over the entire pressure range and a similar correction of $\Delta P_h = 15$ kb for MgO (based on a minimum value of the HEL of 37 kb [*Ahrens,* 1966], the set of corrected equations of state parameters given in Table 6 is obtained.

Rather than introduce a strength correction in MgO, *Thomson* [1969] has fit the shock data at high pressures and the ultrasonic data at low pressures by using a three-parameter equation of state. Although there is little doubt that a strength correction is required for Al_2O_3, the validity of the strength correction procedure for MgO is less clear. The reduced shock-wave data for MgO and Al_2O_3 also compare favorably with adiabats calculated from the Birch-Murnaghan parameters obtained in the ultrasonic experiments (Table 6, Figure 3–5). This result implies that, if the pressure-volume curves for these materials can be described by the Birch-Murnaghan equation, they do not undergo important phase changes over the pressure range of the shock data (this point is discussed