The experimental accuracy of these results is difficult to assess. Although the precision and reproducibility of the ultrasonic interferometer are very high, within ±1%, there are several factors which affect the accuracy of the measurements. The initial sample length and density inside the apparatus are only known to about ±5%. The pressure calibration was developed in terms of solid state phase transitions whose transition pressures are known only within ±1% to ±3%. In addition, errors may be introduced during the numerical evaluation of the differential equations used in the high pressure calculations; the behavior of the numerical integration technique at a discontinuous volume change is not fully known. Therefore, although the scatter of values of repeated measurements is small, the absolute errors may be of the order of ±5% or higher.

DISCUSSION

The curves of the elastic moduli versus pressure for the spherical amalgam samples show slight changes in slope in the neighborhood of 20 kilobars. These slope changes were initially observed in the ultrasonic velocity measurements and are naturally reflected in the elastic constants. Similar slope changes have been observed in two of the constituent phases of dental amalgam (γ-Ag_3Sn and γ_2-$HgSn_{7-8}$).[11] Changes of slope of this type may arise due to any one or combination of several factors; the discussion of these effects has been deferred to the second paper in this series.[11]

Another type of slope change can be observed in the elastic moduli of the micro-cut alloy at lower pressures, Figure 8. This deviation from linearity at low pressures is typically seen in porous materials.[7] Pores, or voids, are present in dental amalgam samples prepared by trituration and