Experimental Data

Previous workers on high pressure shear studies generally made use of equipment patterned after that used by Bridgman (4, 5,6,7). In principle, the devices were simply unconfined opposed anvils. With this type of apparatus, the sample was only a thin wafer of the order of 0.025 cm thick, and unconfined at its periphery so that extensive radial flow occurred. The nature of the shearing force across the face of the sample was taken to be, to a first approximation, constant.

In the Abey-Stromberg apparatus, on the other hand, a bulk sample is used, it is completely confined, and the sample almost completely maintains its original proportions throughout the course of the experiment. Measurements of change in dimensional height before and after an experiment show a decrease of generally no more than 2 %, and part of this represents loss of original porosity. In addition, as mentioned earlier, the bulk strain is found to increase with radius. This is similar to the case of a free cylinder under a torquing force on its end surfaces.

In view of the above, it is obvious that different states of strain occur in the Bridgman type and Abey-Stromberg type apparatus. Different equations are required to convert experimental data in terms of torsional moment to the maximum torsional shear strength occurring at the cylinder's outer surface. An abreviated derivation for the two cases is presented in Figure 1. As seen, the most